To James Montgomery Esq.
with the Author's regards.

AN INQUIRY

INTO THE

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AN INQUIRY

INTO THE

NATURE AND TREATMENT

OF

CHOLERA,

BEING PART I., VOL. II.,

OF AN

INQUIRY INTO THE PRINCIPLES AND PRACTICE

OF

MEDICINE.

BY

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"En physiologie, en medicine, ce sont bien moins les faits qui nous manquent, que des methodes, des principes generaux."—GEORGET.

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TO

JAMES MONTGOMERY, Esq.

THE

IMPASSIONED POET OF RELIGION,

THE PURE MORALIST,

AND

THE EARNEST ADVOCATE OF HUMANITY,

THIS WORK IS

INSCRIBED BY HIS FRIEND,

G. CALVERT HOLLAND.

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INTRODUCTION.

No disease, perhaps, ever engaged the attention so strongly, or enlisted in its investigation talents so various and distinguished, as that which constitutes the subject of the following pages. Zeal, intelligence, and unremitting labour have, in their application to it, been brought largely into operation throughout the civilized globe. No incentive has been wanting to stimulate to unwearied exertion. The obscurity in which the nature of the disease was involved incited to inquiry, and its awfully fatal ravages awakened to vigorous activity the whole powers of the mind to relieve suffering humanity. Besides these motives—than which none are nobler—honors,

reputation and emolument, were the award of those, who, by discoveries or practical usefulness, meliorated the severity of the disease. With such objects to urge to industry and scientific research, men, rich in the acquirements of their age—and the age an era of intelligence—the labours of others of humbler pretensions are fraught with no ingrossing interest. This is at once admitted, and it would be presumptuous in such to solicit even a passing notice, were their efforts exerted on a subject already satisfactorily investigated. Where the light, however, is acknowledged to be imperfect, the earnest endeavours of the humblest to improve it are not unworthy attention. The writer of these pages is not insensible to his peculiar situation—the time at which he offers his remarks—and the nature of his claims to consideration. When the epidemic first broke out in Sunderland, he left his own practice to study it; and when it appeared in Sheffield, he was appointed Physician to the Cholera Hospital of this town.

His opportunities for acquiring a practical knowledge of the disease have been abundant, and his zeal has prompted him to make use of them. On these, however, he lays no particular stress, as the opportunities of many others have been much greater than his own, and their exertions as unwearied. The advantages which he claims in some respects over these, are certainly not those of superior acquirements, talent, or experience, *but of time and the accumulated labours of others.* These have enabled him to review the disease in its perplexing phases, and, perhaps, occasionally in a clearer and more sober light than presented itself to minds actively engaged in its investigation, and influenced unduly by their own researches. The epidemic has happily quitted our shores, and thus allows the inquirer to examine dispassionately its phenomena—the accompanying conditions of the vital powers—the causes of their liability to disturbance, and the numerous remedies which have been adopted for the cure of the disease.

The author has proposed to himself this task, and has spared no pains in its execution. He has not introduced into his pages cases illustrative of the efficacy of any remedy or plan of treatment, but has endeavoured to ascertain the character of the morbid conditions in different constitutions, or under different circumstances, as well as to explain the action of various important remedies which are naturally suggested by the inquiry into these conditions. This he regards as the proper mode of procedure, and one calculated not only to throw light on the subject of investigation, but on many others of great interest and practical value. This mode of studying the disease is unquestionably attended with some advantages —it frees the mind from particular prejudices and tendencies, and gives greater comprehensiveness to its views. The perusal of these pages, will, perhaps, produce an impression, that the powers of medical art have their limits, and these, at times, exceedingly circumscribed. One object of the author has

been to define these limits, and not to present them in unnatural dimensions, magnified by imagination. With these few prefatory remarks, he leaves his labours to the judgment of the candid reader.

CHAPTER I.

CHOLERA MORBUS.

SECT. I.

Symptoms of the Disease.

THE science of medicine does not require for its improvement additional facts, so much as an accurate understanding of those already ascertained. Were our acquaintance with cholera much greater than it is, it would be of little value, unless accompanied by an enlarged view of physiological principles, as is evident from the numerous statements of those who have had sufficient opportunities of investigating the nature of this formidable disease, and of harmonizing (if experience alone would render them competent to the task) the striking discrepancies of opinion

relating to it. It is, however, indisputable, as a reference to medical works on this subject will fully prove, that repeated observations have not yet led to a clear conception of this disease, nor suggested a uniform and intelligible line of practice, rationally deduced from a knowledge of facts.

I have dwelt at some length in the preceding volume, on a few of the more important functions of the animal economy, preparatory to the development of new views on cholera, which, by clearly shewing the cause of the morbid changes discovered on dissection, seem to explain, in a perspicuous manner, the origin and nature of the disease, and to suggest at the same time, as a necessary consequence of an intimate knowledge of the malady, the proper mode of treating it. We may, therefore, be supposed to enter upon the present inquiry with reasonable anticipations of throwing additional light upon it. Nosologists mention several species of cholera, but it is not my intention minutely to describe them, since, although they differ greatly in the severity of their symptoms, the general physiological principles previously laid down will almost equally explain them all. The disturbance of

the sanguiferous system in this disease, which is always considerable, necessarily produces many morbid effects. The blood is particularly *internal* in its distribution, in consequence of which, congestion and inflammation of different viscera occur; the vital powers either rapidly sinking, as if from sudden exhaustion, or gradually becoming extinct; the extremities and surface of the body are generally cold, though, in certain stages of the disease, hot and dry, the latter symptoms arising from diminished evaporation rather than from increased production of heat; whilst many irregular actions occur, and many painful sensations are felt, which will hereafter be severally considered. The cholera of this country is rarely an affection of great severity. Its ordinary symptoms are sickness, occasional vomiting, frequent alvine evacuations, acute pain in the abdomen, sense of oppression about the præcordia, a small, frequent, and sometimes almost imperceptible pulse, which symptoms often disappear in a few hours. When the disease assumes, however, a more urgent form, it is attended with vehement vomitings, "difficult and painful dejections of ill-conditioned fluids, agony and inflammation of the intestines and abdomen, cardialgia, thirst, a

quick pulse, often small and unequal, heat, and anxiety, nausea, and colliquative sweats, spasms of the arms and legs, fainting, coldness of the extremities, and other symptoms of equal danger, which terrify the bystanders, and kill the patient in twenty-four hours." The disease is of more frequent occurrence in India than in this country, and as it is there generally distinguished by strong spasms, it has been designated by many authors spasmodic cholera. "The attack is generally ushered in by a sense of weakness, trembling, giddiness, nausea, violent retching, vomiting, and purging, of a watery starchey whey-coloured greenish fluid. These symptoms are accompanied, or quickly followed, by severe cramps, generally beginning in the fingers and toes, and thence extending to the wrists, and fore arms, calves of the legs, thighs, abdomen, and lower part of the thorax. These are soon succeeded by pain, constrictions and oppression of the stomach and præcordia, great sense of internal heat, inordinate thirst, and incessant calls for cold water, which is no sooner swallowed than rejected, together with a quantity of phlegm or whitish fluid like seethings of oatmeal. The actions of the heart and arteries now nearly cease; the pulse

either becomes altogether imperceptible at the wrists and temples, or so weak as to give the finger an indistinct feeling of fluttering. The respiration is laborious and hurried, sometimes with long and frequently broken inspirations. The skin grows cold, dank, and disagreeable to the feel, and sudden prostration of strength, anguish, and agitation. The countenance becomes collapsed, the eyes suffused, fixed, and glassy, or heavy and dull, sunk in the sockets, and surrounded by dark circles; the cheeks and lips livid and bloodless; and the whole surface of the body nearly devoid of feeling. In feeble habits, where the attack is particularly violent and unresisted by medicine, the scene is soon closed. The circulation and animal heat never returning, the vomiting and purging continuing, with thirst and restlessness, the patient becomes delirious, or insensible, with his eyes fixed in a vacant stare, and sunk down in the bed."*

* Extract from the report of the Medical Board of Bengal. It is curious to observe how accurately the following description from FRANK, written many years ago, applies to the disease, as it has lately appeared in different quarters of the globe:—"The cholera commonly attacks the patient with suddenness and violence. Sometimes we find these premonitory symptoms: a sense of lassitude, tension, and pain of the stomach, acid and fetid eructations, nausea, frequent spitting, flatulence, and borborygimi pungent

This is an excellent description of the disease occurring in its worst forms in India, as well as of that which has so recently visited this country. In order, however, satisfactorily to understand and efficiently to treat this dreadful malady, it is necessary to examine it in its different progressive stages. The premonitory symptoms of it are extremely various, modified, of course, by the natural temperament of the constitution, the habits and pursuits of the individual affected, and the severity of the exciting cause: in some cases terminating abruptly, perhaps, in a few hours, in collapse; in others continuing to exist for several days, though gradually increasing until at last

cholicky pains. After a time, violent vomiting and purging set in, sometimes together, sometimes alternating with each other. At first the egesta are like water; then, as if flesh had recently been immersed in them,—sometimes they are white, sometimes dark,—in others, which is uncommon, they are merely a limpid lymph—in many cases, the discharges are, first, the remains of the food that has been taken, afterwards fluids of a bilious character, more or less mixed with mucus, now yellow, now æruginous, now dusky, dark, often very acid and almost corrossive, with copious eructations, sometimes even blood, very frequently repeated, and with such sudden prostration of strength, that not uncommonly a suspicion of poison having been taken presents itself. The stomach, in the interim, and the intestines are convulsed in an extraordinary manner. The patient is affected with the most severe pain at the scrobiculus cordis, intense thirst, a shrill raucous voice, and with a great sensation of gnawing or erosion at the umbilicus; tenesmus is urgent. The urine in many cases is retained, or if passed

the disease unequivocally manifests itself. The more intelligent and respectable of the unfortunate individuals who have been attacked by cholera, state, that the first uneasy sensation they felt was a fullness of the stomach, as if they had taken too much food, or something which had disagreed with them: they often, indeed, refer the derangement to some particular article of diet. The early stage of the disease is attended by the following symptoms:—The abdomen slightly tympanitic, and somewhat painful on pressure, immediately over the pit of the stomach; the tongue generally rather white, occasionally furred; the pulse more frequent than natural by about

is hot and irritating. As the disease advances, hiccup succeeds—the muscles of the thighs, legs, and arms are seized with spasms—the fingers are flexed and contracted, the nails are livid, the extremities are cold, and covered with a cold clammy sweat, whilst the internal parts feel burning, and there is syncope. The pulse, previously contracted and very small, now becomes frequent and irregular, now no longer to be felt. In the worst cases of cholera, the patients, exhausted by the profuse and rapid discharge of humours from the stomach and intestines, and by their cruel torments, mental and corporeal, exhibit in five or six hours a remarkable change in their features, which are *collapsed, and no longer like themselves.* Unless the patient is speedily relieved, he sinks in the space of twenty-four hours, or on the second, third, seldom later than the fourth day.—*De Curandis Hominum Morbis, &c. Lib.* 6 *tus. p.* 242, *et Seq. Edit. Viennæ, Austriæ,* 1807, *Vide Medico Chirurg. Review, April,* 1832, *p.* 631.

seven to twelve pulsations in the minute; the aspect of the countenance altered, but the change not sufficiently great to be evident to ordinary observers; the eyes rather glassy, assuming an appearance similar to that which they exhibit at the commencement of most fevers, though not so strongly affected; the features generally of an anxious expression, sometimes, however, wanting only their usual clear and healthy complexion.

During these symptoms the patient feels so little disordered as to consider it unnecessary to consult his medical attendant, which he does only at the urgent solicitations of friends; but if the symptoms are not relieved after retiring to rest at the usual hour, apparently no worse than during the day, he is liable to be disturbed soon after midnight by sickness, which is quickly succeeded by vomiting and purging, accompanied with great pain about the præcordia, a quick hurried pulse, coldness of the extremities, a clammy condition of the skin, thirst, diminished production of animal heat, oppression in the breathing, cramps in the toes or calves of the legs, and an extremely anxious expression of countenance. The patient becomes now considerably alarmed,

being strongly apprehensive that he is attacked with the prevailing epidemic, of which, however, in the alvine evacuations, and the matters ejected from the stomach, there is at this time no positive proof. The symptoms previously enumerated, may be considered as premonitory in the well regulated orders of society, among whom, however, few cases of cholera have occurred during the protracted ravages of the disease in this country ;* but in the inferior ranks of life many of these symptoms are scarcely noticed ; the grosser vices in which the lower orders of society are apt to indulge, and the numerous hardships to which they are exposed, rendering them little attentive to slight functional disorders. When

* There never was, perhaps, an epidemic more strictly confined to one class of society than cholera has been in this country. Its ravages have not been observed, beyond a few solitary cases, in the higher and middle ranks of life, and even those, with few exceptions, occurred in persons particularly predisposed to the malady from intemperate living, dissipated habits, great bodily fatigue, or depression of mind. The robust and the healthy were not liable to its attacks, nor, indeed, were even the naturally delicate in the respectable spheres of life. Only five cases of decided cholera characterized by symptoms of collapse, or vomiting and purging, have appeared, to the best of my knowledge, among such persons in Sheffield and Rotherham, a neighbouring town containing, perhaps, six thousand inhabitants, in both of which places the disease was extremely virulent. The mildest form of diarrhœa, or mere flatulence of the stomach, cannot,

they seek medical advice, they constantly complain of severe purging, which, on inquiry, is generally found to have existed several days, sometimes much longer, being frequently accompanied with sickness and vomiting, small and frequent pulse, and cold extremities, in which all the endeavours of the patient cannot produce an agreeable degree of warmth, whilst the toes, the calves of the legs, or the muscles of the back, are often seized with cramps, and the countenance is painfully anxious. There is not a subject connected with cholera more deserving investigation, than the condition of the animal economy in those who are peculiarly liable to the disease, as it is imagined by some, that persons in perfect health are often suddenly attacked with its most appalling symptoms. My own experience, which has been extensive, furnishes very

with any propriety, be designated cholera ; and even of this description the number of cases requiring medical aid, was very limited. Of the five alluded to, four died. One of these had led, for several years, a most dissipated life ; another, a female, had had derangement of the bowels for many weeks ; the third, also a female, had, a few hours previous to the attack, eaten very freely of cucumber ; the fourth was a person between sixty and seventy years of age, of particularly gross habit of body, who neglected calling in medical assistance until the disease had made considerable progress The one that recovered had committed, for some days immediately preceding the attack, several imprudent excesses.

few examples of this description. In almost all the cases which came under my observation, the decided symptoms of the epidemic were preceded by premonitory indications of various kinds. Diarrhœa, among the lower orders of society, was so frequently found to prevail, that some regarded it as necessarily a precursor of the formidable disease, which it cannot, however, be considered, many having been attacked by it, in whom this symptom did not previously exist. Such persons had generally some functional derangement, which rendered the system highly susceptible of morbid impressions, the derangement being occasioned by sensual excesses, low and filthy habits, poor living, or the constant breathing of deteriorated air. In those cases in which it was impossible to trace the operation of any of these agents, it was commonly produced by some evident cause, such as vegetable substances difficult of digestion, exposure to cold, or mental depression, but never observed mysteriously attacking persons previously healthy.

The premonitory symptoms of the disease, if not relieved by art or the efforts of nature, pass quickly into the stage of collapse, particularly in weak and debilitated constitutions.

It is not possible to specify the exact period in which this change takes place, since, from the influence of many circumstances, it may occur at different times. In the inferior ranks of life, the collapse generally happens from twelve to eighteen hours after the commencement of the disease; in the higher classes of society, often not till several days subsequent to the first attack. Among the remarkable symptoms observed in this stage of the affection, is the altered expression of the countenance, which is so different from its natural appearance, as sometimes to render it difficult to recognise the individual thus affected. The eyes are sunk in their sockets, surrounded by a dark areola, the features of the face depressed and angular, the lips, as well as the whole surface of the body, of a blue or livid colour, occasionally so strong as to convey the idea of being artificially produced: the same livid hue is commonly apparent in the hands and lower extremities, even when the surface of the body is not particularly affected. This peculiar appearance has never been general or striking, so far as my own observation has extended, in any but the most wretched of mankind, who were possessed of little constitutional vigour, in consequence of wanting proper food,

or indulging in intemperate excesses; and it seems probable, that it can scarcely take place, except in patients of this description, *the vital powers in persons better fed, and more temperate, not admitting of sufficient depression of the sanguiferous system to give rise to it.* In those instances, in which this symptom is not remarkable, the face and the surface of the body have always an ex-sanguineous appearance; the former, at the commencement of the stage of collapse, has often a greasy aspect, which, in the progress of the disease, is succeeded by a cold clammy perspiration, causing the hands to appear quite sodden, a peculiarity occurring, in so remarkable a degree, in no other affection. The pulse, if not altogether imperceptible at the wrist, is frequent and extremely small, and the tongue is flabby and cold to the touch, —the thermometer, on being applied to it, often indicating little more than 80° or 85°. The state of the tongue, however, is variable, and it is highly important to observe its different conditions, as they suggest a different line of practice. On some occasions it is red and perfectly clean; on others, rather white and very much furred.

Experience has proved to my own satisfac-

tion that the same remedial measures are not equally efficacious in those cases of this disease in which such opposite conditions of the tongue exist. The patient, when unaffected with cramps, rarely complains of acute suffering; in the absence, indeed, of cramp and vomiting, he has no pain, the cerebral sensibility being probably diminished, as it often evidently is in this disease. When aroused, he is collected in mind, and answers rationally any questions addressed to him, though he is liable to fall soon into the same lethargic state: yet, in some cases, the patient exhibits even more than the usual degree of sensibility. The brain is variously affected in different persons. In some its functions are very slightly disturbed during the whole course of the disease; in others the disturbance is great. Many instances came under my notice, both in Sheffield and at Sunderland, in which it was no easy matter to awake the patients out of a heavy stupor, or to prevent an immediate relapse into it. It has, however, been stated, by some writers on cholera, that the brain is not at all affected in this disease, which is contrary to my own observation, and that of most other practitioners, as well as to the appearances discovered on dissection. It is, indeed,

much less frequently and extensively deranged than the chylopoietic viscera, and, on many occasions, so slightly as not to be observed: but yet, in many cases, it is the seat of considerable disease. The cause of these discrepancies will be investigated in the subsequent pages. Vomiting and purging are symptoms extremely distressing to the patient. The former is almost certain to be violently excited by liquids of every description, and even when the stomach is not thus irritated, it is, at short intervals, continually ejecting its contents; not, however, so frequently in small quantities, as in a full stream, taking both the patient and those in attendance by surprise; the vomiting being followed by retching and sickness, which exhaust the enfeebled energy of the constitution. There is but little variety in the appearance of the matters ejected, being generally like barley water, or very thin and imperfectly boiled gruel, in which small flocculent particles float in a slightly turbid fluid. When vomiting has existed several hours, the sensibility of the system is much reduced, in consequence of which, its occasional repetition causes less acute suffering than it did at an earlier stage of the disease, and is not succeeded by the same degree of

nausea as before. Vomiting is a prevailing and urgent symptom in most cases of cholera, yet there are many, and these of the most severe and fatal character, in which this symptom scarcely exists, the vital energies rapidly sinking without any of them displaying the least degree of re-action or vigour during the appalling progress of the malady. No case has fallen under my own observation in which there was no vomiting, but several instances have occurred, in which it was so slight, that the sudden depression of the powers of life could not possibly be attributed to its influence. Severe purging is as invariably a symptom of this disease as vomiting, and the frequent and copious evacuations occasioned by it, have a strong tendency to reduce the vigour of the constitution. It is seldom accompanied, in the stage of collapse, with much flatulence, or griping pains, the contents of the bowels being almost silently passed, and with little or no suffering. The character of the motions is pretty nearly the same in all well-marked cases of cholera, being similar to what is ejected from the stomach, but occasionally exhibiting larger flocculent particles, floating in a more turbid fluid; yet, though it is generally difficult, if not impossible, to dis-

tinguish one from the other, the alvine evacuations are certainly more variable in appearance than those of the stomach, being sometimes, though not often, rather white, bearing some resemblance to pus, particularly when allowed to remain undisturbed in the vessel into which they are received ; at others, of a dirty green, as if a substance of this colour, and of a somewhat stringy nature had been rubbed in water. There is not, perhaps, a symptom more characteristic of cholera than the inordinate thirst which attends it. This is so urgent, that the patient is continually requesting to have something to drink, and, though his request is frequently granted, the thirst is allayed only for a moment. Liquids of all kinds, however, have a tendency to excite vomiting, and this is often immediately produced if more than a few tablespoonsful of any kind are administered at one time. In the stage of collapse, the thirst sometimes appears not at all urgent, but this arises from an evidently diminished sensibility of the brain, *during the existence of which, that state of the internal organs which usually produces in the mind the feeling of thirst, fails to excite it.* The truth of this seems to be proved by the fact, that when the patient is aroused

from his lethargy, by the application of water to his lips, he swallows it with great avidity, and would take, if permitted, much more than ought to be given.

The respiratory apparatus is as constantly disordered in this stage of cholera, as the stomach and bowels, though not so obviously to ordinary observation. The breathing is rather short and frequent, than laborious, being apparently performed without any pain, and very different from that which attends inflammation of the lungs, spasmodic and humoral asthma, diseases of the heart, or any affections of the chest in which difficult respiration occurs. Its shortness and frequency increase as the disease advances towards a fatal termination, until at last the breathing is accompanied with so little motion of the thorax as scarcely to be perceptible. In some instances, however, the respiration is deep and sonorous, and the parietes of the chest are strongly elevated, but this happens only in the very last stage of collapse, in which the patient lies apparently indifferent to internal and external impressions, being free from vomiting, nausea, and spasm; yet, even at this time, it cannot be called *difficult,* in the sense at least, in which

that term is usually understood when applied to respiration, as designating labour and anxiety in the performance of it. The short and frequent breathing indicates that the lungs are congested, for whenever they are in this state such a mode of respiration necessarily occurs, the system endeavouring to accomplish by frequency of action, what it performs in health with ease and comparative slowness. The tone and volume of the voice are much changed, but it is only in those cases in which the striking symptoms of collapse exist, that this change is very perceptible. Sometimes it is small and feeble, being occasionally attended with a certain degree of roughness, strongly characteristic of the worst forms of this disease, though, perhaps, this peculiarity of voice will be better described by the term *huskiness*. Cramps and spasms are generally extremely severe at the commencement of the stage of collapse, when the vital energies appear to be struggling against the depressing influence of the malady ; but when these become much exhausted, the violent contractions gradually subside, or only occur at distant intervals. They most commonly attack the toes and the lower extremities, though the muscles of the back are also often strongly

affected, causing the most excruciating pains; those of the abdomen are stated to be frequently seized in India, where this disease occurs in appalling virulence, but in this country I have not seen more than one or two cases in which these muscles were the seat of spasms.

During the continuance of these formidable symptoms, the secretions generally are disordered. The copious evacuations from the stomach and bowels betray the morbid condition of the chylopoietic viscera; the entire absence of bile in the motions clearly indicating the severe derangement of the liver, which, on dissection, is found congested, occasionally to a great extent. The gall-bladder is, however, in most cases, full of bile, from which it seems probable, that the action of the secretory functions of the liver is not so completely arrested as might be imagined from the absence of this fluid in the alvine evacuations. It is evident from the clammy state of the surface of the body, that the secretory functions of the skin are greatly disturbed. One of the most characteristic symptoms of the disease is, perhaps, the disordered condition of the kidneys; the secretion of urine being generally either alto-

gether or partially stopped. In the most violent cases this important function seems to be wholly suspended, but in many it continues to exercise, though but in a slight degree, its ordinary office: the statement, therefore, of most writers on cholera, that no urine whatever is secreted, is not altogether correct, this being the fact only in the worst cases. Many cases of this kind have fallen under my observation, in which no urine was expelled for several days, and even when the patient was gradually recovering from the disease, this secretion was not completely re-established for some time. The next symptom of importance, in the stage of collapse, is the morbid state of the blood, of which not only the circulation is deranged, from being accumulated in the internal organs, or being considerably diminished in quantity, in consequence of abundant excretions of various kinds, but its properties are proportionately modified. The blood drawn from a vein in this state is always extremely black: the arterial fluid differing, in this respect, only slightly from the venous, as the chemical changes in the lungs are very imperfectly accomplished: so much vitiated, indeed, are the qualities of the blood, that leeches are with difficulty induced

to bite, sometimes altogether refusing to do it, and of those which do bite, many die in consequence of the bad state of the blood they have imbibed.

If these symptoms are not diminished, the vital energies gradually become extinct; in some instances, in a very short time, the average period being from twelve to eighteen hours. The breathing, as before stated, generally becomes so short and easy as scarcely to be perceptible from the gentle motion of the chest, and the patient expires without any severe bodily agitation or suffering, although apparently sensible to the last. This sensibility, however, has often appeared to me, much less perfect than it is generally supposed to be. When the patient is aroused a little before death, there is a degree of wildness, or indifference in the expression of the eye, even in the most favourable cases of this kind, which by no means indicates any thing like perfect sensibility, and, in the majority of cases, there is incoherence of thought, if not decided aberration of mind, sometimes indeed so strongly manifested, that the patient raves, and occasionally attempts to leave his bed. When the symptoms of collapse do not ter-

minate in death, a slight increase in the temperature of the system is often one of the first favourable indications of amendment. The surface of the body, previously extremely cold and clammy, becoming a little less disagreeable to the touch. This very equivocal improvement seems to exist alone for sometime, and, though it is far from affording sufficient ground to calculate on a recovery, it yet holds out a glimmering of hope which encourages still further exertions. In the course of a few hours, the clammy condition of the skin almost entirely disappears, or, if any part of it remains, becomes more like natural perspiration: the inferior extremities being yet excessively cold, and the pulse only just perceptible, no decided alteration having yet taken place in the various symptoms of collapse already enumerated, except that they appear to have become stationary. In a short time, however, a change in the tone of the vital powers is manifested by the whole system: the pulse is felt distinctly at the wrist, the heart, examined by the stethoscope, being found to contract with greater force, and to emit a much clearer sound than it did before; the surface of the body is dry and warm, the extremities, also, having lost their disagree-

able chillness, the respiration is less short and frequent; the voice is somewhat stronger, though still retaining much of its huskiness; the features of the countenance are less anxious; the thirst is still urgent, continuing long a prominent symptom; and the sensibility of the patient is increased, as is evident from his greater restlessness. No urine, however, is as yet excreted, the patient sometimes complaining that he has the desire, but not the power to expel it.

These symptoms, which may be regarded as the first premonitory indications of improvement, are succeeded by others of a much less equivocal kind; namely, those, of local inflammation, fever, and other morbid phenomena. The pulse acquires much greater strength, though it is still frequent and rather feeble; the skin is hot and dry, the tongue parched and covered with a dark brown matter; urine is secreted and expelled, though in small quantity; there is little sickness, except when excited, which is not an unfrequent occurrence, by the patient drinking too copiously of warm tea or gruel. The irritability of the stomach continues long after the severe symptoms have subsided. The bowels are in

general frequently moved, the evacuations having lost their rice-watery character; yet being, in the course of a few hours, so extremely various in different cases, and often even in the same, as to render it almost impossible to give any general description of them which shall embody all their prevailing peculiarities. For some days there are no appearances of healthy motions, and within this time, the traces of feculent matter are very rarely observed. The stools are liquid, sometimes of a green, or a brown colour, occasionally of a dirty white, apparently as if mixed with pus and blood; and always extremely offensive to the smell. When the evacuations are of a pretty natural consistency, they are small in quantity, and as various in appearance as when quite liquid: being at one time black, or of a very dark colour, at another white, as if chiefly formed of pus, and not unfrequently mixed with blood, exhibiting much the character of dysenteric motions. In no single instance do I recollect seeing in this, or any other stage of the disease, a quantity of bile in the stools, such as often appears in them after an improvement has taken place in the severe symptoms of the ordinary cholera of this country.

The appearance of bile in the evacuations is one of the most favourable indications accompanying the amelioration of the disease, and of the cases which have come under my own observation, those in which it was exhibited, though only in a slight degree, were generally the most easily cured; the cases in which no such appearance was manifested, being on the contrary the most difficult, and generally the most fatal. In the milder cases of cholera, that is such as do not exhibit the appalling symptoms of collapse, displaying at the worst, only a tendency towards it, with slight vomiting and purging, fever but seldom occurs after the mitigation of these symptoms, and, even when it does, rarely assumes a typhoid character, or continues beyond a few days. In the more severe cases, fever of a typhoid type very frequently succeeds the stage of collapse, being often as difficult of cure as the previous disorder, and always much more tedious. The instances are comparatively few, in which consecutive fever, partaking more or less of the nature of typhus, does not succeed the melioration of the severe symptoms. Whether the organs of the chest, the head, or the abdomen, are particularly affected, the accompanying fever is generally of this character.

Extensive experience in the treatment of cholera, on which the previous observations are founded, has convinced me, *that the occurrence of the fever, and the degree of its severity, are very much influenced by the practice pursued in the stage of collapse.* Although, in the cases I examined, it did not appear that the use of calomel was often productive of immediate and decided benefit, it yet seemed indisputable, that, where this treatment was adopted, the consecutive symptoms were much more tractable than when it had not been employed. The organs at this time most frequently diseased were the brain, and the abdominal viscera, particularly the stomach and the liver. In many of those cases in which the brain was affected, the symptoms exhibited considerable inflammatory action, to control which, it was necessary to have recourse to leeches, blisters, cupping, and occasionally to the abstraction of blood from the arm. Cases, characterised by cerebral disorders, were more like those of typhus than any other that occurred, though they differed in many essential points from such diseases. The nervous system, in the former, displayed a higher degree of irritability than is generally observed in the latter—an irritability apparently more closely allied to

inflammation than simple congestion, *which is the prevailing condition of the capillaries in typhus.* Indeed, so generally was this symptom manifested, that it would have appeared injudicious in the extreme to have employed tonics and stimulants, often so imperatively required in the treatment of really typhoid diseases, in which the existing nervous irritability is considered a symptom of great exhaustion, or oppression, of the vital powers. In typhoid cases, succeeding cholera, the heat of the skin is less than in those occurring under ordinary circumstances, and the surface of the body does not feel so disagreeably parched to the touch as in the latter. Cases, of the former kind, occur, in which there is no irritability, though it is evident, from the existing stupor, the heavy and unintellectual expression of the countenance, and the annoying symptoms of occasional sickness and vomiting, that the brain, and the greater part of the nervous system are affected. It is scarcely possible to confound cases of this description with those of typhus, the tongue, in the former, being generally clean and red, or only slightly furred, and the teeth and gums not so thickly covered with sordes as in the latter. Such cases are extremely difficult of cure ; none in my prac-

tice having been found so troublesome and unsatisfactory. The application of leeches and blisters to the epigastric region, and the exhibition of many various internal remedies, were too frequently of no avail whatever. They rarely seemed even to palliate the severe symptoms. Other cases consecutive of cholera were characterised by dysenteric symptoms, the abdomen being particularly painful on pressure; the evacuations frequent, mixed with blood, and otherwise unnatural in appearance; the tongue white and furred, the pulse frequent and rather hard, accompanied with little disturbance of the cerebral functions. The lungs, on the whole, were less severely diseased in this consecutive stage than any other important organ, most probably from being less disordered during the symptoms of collapse. These remarks are sufficient to give a general idea of the prevailing peculiarities of this disease. They might easily be extended to a greater length, in detailing other peculiarities which often exist, as great variety of morbid phenomena is observed in the numerous cases which occur, but it is not necessary to enter here more fully into the subject.

SECT. II.

Pathology of the Disease.

In endeavouring to form a correct notion of the nature of cholera, practitioners have been continually perplexed by the great variety of symptoms that attend it; so many functions being simultaneously disordered, between which it has been found difficult to trace any necessary connexion so as to discover which of the various organs is first affected. The head, the chest, and the abdomen, are all deranged, and, on dissection, morbid appearances are discovered in each. To account for this general disturbance of the vital powers, some have supposed that the ganglionic system of nerves, others, that the eighth pair, is primarily diseased; some have thought that the vital principle is suddenly diminished by depressing causes, the operation of which, however, has by no means been clearly explained; others have referred the various symptoms to the

process of inflammation existing in some of the chylopoietic viscera, or to a vitiated condition of the blood, occasioned either by the addition of a deleterious agent, or by the abstraction of something essential to its healthy properties. The nervous system has been most generally regarded as the primary seat of this formidable malady, but the manner in which it has been supposed to give rise to numerous co-existing phenomena, has been differently explained. The pathological principles I shall shortly lay down, will, perhaps, be admitted to go far towards proving that none of these opinions are exclusively founded in truth; though all of them are, to a certain extent, corroborated by facts, because as the whole of the animal economy is involved in the existing disease, it necessarily follows, that any particular organ fixed upon as its primary seat, and the cause of its numerous symptoms, will be disordered, *and may, therefore, be adduced with considerable plausibility, in support of the novel doctrine with which it is associated.* It is in this way that most of the hypotheses seem to have for their foundation a resemblance to truth. That doctrine, however, is alone true which satisfactorily explains the derangement of the whole system by account-

ing for the different steps in the morbid process which gradually evolves the appalling symptoms of cholera. Before we examine in detail the several parts of the nervous system, which have been individually regarded as primarily affected in this disease, and as being the cause of its characteristic phenomena, it may be well to consider the manner in which this system is generally liable to become disordered, since we shall thus be much better prepared to investigate any of its various subdivisions.

There is no decided evidence that the nervous system is particularly, if at all, affected in the premonitory indications of the malady. Diarrhœa may exist alone for several days, during which time the bowels may be so slightly disturbed as not at all to interfere with the ordinary avocations of the patient, or scarcely, indeed, to produce a painful sensation. As this symptom has very frequently preceded the unequivocal phenomena of the disease, it is just to consider it, in such instances, as the first step in the morbid process. Diarrhœa may, perhaps, be defined as arising from an irritated condition of the mucous follicles, or secretory organs, of some

part of the intestines, which irritation may be caused, by food imperfectly digested, impure water, abundant or vitiated bile, depressing emotions, external application of cold, medicinal substances, unhealthy intestinal secretions, and by various other agents, which it is not necessary to enumerate. It is not possible to prove, that diarrhœa, in this stage of the disease, is attributable to any peculiar state of the nerves of the chylopoietic viscera, nor is it, indeed, probable that it arises, at any time, from this cause. There is, however, one circumstance which gives a strong colouring to such a supposition, viz. diarrhœa succeeding depression of mind.

This phenomenon may, nevertheless, be explained by the existence of a morbid condition of the secretory organs produced from disorders in the distribution of the vital fluid, which takes place in cases of mental depression. The distribution of this fluid is indisputably modified by sudden fear, the blood, under the influence of such fear, being evidently *internal* in its circulation, so that diarrhœa thus occurring, may be fairly considered as arising from the natural relations between the secretory organs and the blood being dis-

turbed; or, supposing the peristaltic motions of the bowels to be directly deranged by the mind, a supposition by no means improbable, these relations may still be disturbed, and diarrhœa succeed in consequence of this disturbance. It would, indeed, appear from an investigation of the function of secretion, that this function is performed by appropriate organs in which it is impossible to trace the immediate operation of nervous influence, either in a healthy or diseased condition of them. Though it may be admitted, that an affection of the nervous system cannot be discovered in diarrhœa, immediately preceding the formidable symptoms of cholera, it may, perhaps, be imagined that such affection subsequently takes place, and is the cause of numerous morbid effects observed in the system. To determine this point, let us examine in what way the vital energies are liable to be disordered by diarrhœa assuming a more aggravated form, giving rise to, or becoming associated with, severe symptoms. An increase in the frequency of the alvine evacuations, exhibiting in their appearance considerable derangement of the intestinal secretions, cannot be adduced as any evidence of the implication or injurious influence of the nervous sys-

tem; nor will the force of the foregoing observations be at all invalidated by any difference in the degree of this symptom. The more urgent diarrhœa is sometimes accompanied with flatulence, nausea, and vomiting, the combined operation of which quickly enfeebles the vital powers; the surface of the body becoming pale and livid, whilst the extremities are cold, the generation of animal heat being diminished, and the pulse being small and frequent. During the existence of these morbid phenomena, and others which succeed them, the nervous system is undoubtedly affected, but they cannot be shewn to be produced by any direct influence excited by it.

An inquiry into the nature and action of some of the exciting causes of this disease would prove that the nervous system, and the whole animal economy, are generally and necessarily disordered by the vitiated properties and irregular circulation of the blood; and it must be allowed, that every part of this system, so disturbed, will become a cause of additional derangement, proportionate to the degree of its depression, and the importance of its function. The nausea and vomiting accompanying diarrhœa, arise from

the derangement of the stomach, consisting most probably in a morbid condition of its secretory functions, in consequence of which, disagreeable sensations are conveyed to the brain, by the re-action of which organ, the vomiting is occasioned; but though the nerves of the stomach and the brain are evidently connected with the existing mischief, that connexion is not of such a nature as to account for the production of the numerous phenomena characteristic of the disease. This reciprocal nervous agency must, of course, have a cause, and we may, perhaps, be allowed to suppose that the disorder of the secretory functions of the stomach is this cause, but such disorder may arise as independently of nervous influence, as the secretion of bile or urine, and the previously mentioned phenomena cannot, therefore, be said, with any propriety, to originate in disease of the nervous system. The sudden sinking of the powers of life occasionally manifested in this malady, is not always attributable to an actual expenditure of the fluids of the body, arising from copious excretions, but sometimes occurs when there is neither vomiting nor diarrhœa. In cases of this kind, which are almost invariably fatal, the nervous system is not affected in the same

manner, nor to the same extent, as in those in which this system gradually becomes involved in the disease from the actual expenditure of fluids absolutely necessary to the existence of every part of the animal economy.

Under these circumstances, nervous energy necessarily fails, and its failure co-operates with co-existing causes of depression, to arrest all vital actions. In those instances in which the powers of life sink rapidly, unaccompanied by either vomiting or diarrhœa, the nervous system is generally affected, less, however, from a deficiency *of the circulating fluids, than from some extraordinary modifications produced in the condition of the blood, by which it is incapable of effecting the healthy operations of the animal system.* Such cases are generally referred to nervous exhaustion, which is considered as the cause of the long train of evils; but though such affection of the nervous system will tend, as observed before, to aggravate other co-existing symptoms of disorder, *in proportion to the severity of the affection, and the importance of the functions performed by the system,* the cause of the numerous morbid phenomena must be sought for, *in that which occasions the nervous depression itself, as well as the severe de-*

rangement of every function of the body. Cases in which there is neither vomiting nor purging, are extremely rare, and, perhaps, never occur, except in the most debilitated constitutions, so that even in these the animal system may be as greatly enfeebled by a gradual deterioration of its powers, as when weakened by an expenditure of the circulating fluids in copious excretions.

Exhaustion of the nervous system is often incorrectly represented as the cause of many morbid conditions of the body, particularly of cholera; in the latter case, this representation is the source of much fallacy; first, leading to the supposition that the nervous system is chiefly, if not almost exclusively, affected; and, next, that the disease arises wholly from the loss of nervous energy. Prevailing errors in medical doctrines are in a great measure attributable to the confined view which has been often taken of the seat of disease, or the operation of remedies; and by circumscribing his investigations to the nervous system, the pathologist is liable to entirely overlook, or but partially consider, many important organs, whilst he frequently attributes to that part of the animal economy which has been mi-

nutely examined by him, extraordinary powers which it does not possess, in order to account for various morbid derangements. No direct and satisfactory evidence can be brought to prove that cholera is a nervous failure, and this supposition, moreover, can be but partially true, as the nervous system is only a part of the animal economy which is *wholly* disordered. We know nothing of the nature of nervous energy, and are only enabled to determine the causes which influence it, and the manner of their operation, by considering its different degrees of activity in connection with different conditions of the vital powers; a mode of proceeding which cannot fail to lead to enlarged and accurate views of the pathology of diseases, and to suggest the employment of the best practical measures. Many writers have endeavoured to prove, that cholera originates in a morbid condition of the ganglionic system of nerves, and it may, therefore, be well, briefly to examine the natural functions of this system, in order to understand how it can exercise, when disordered, such extensive influence on the animal economy. It is probable, that its numerous nerves, distributed to the abdominal and thoracic organs, endow them with the property of motion or contrac-

tility, for such nerves alone exist in many of the lower gradations of animal life, in which this property is strongly manifested. It is not, however, necessary to ascertain whether these organs be indebted for their powers to other nerves, and, in that case, to what extent, or to some principle inherent in the contractile fibra itself, our object being now, not to settle this interesting question, but to shew, that the ganglionic system of nerves is one source from which those organs derive the power of contractility. The cerebral nerves are associated with these in all the important organs of the body, partly, perhaps, for the purpose of conferring upon these organs the faculty of sensibility, as well as becoming the medium of communication between them and the brain, so that irritations or impressions, originating in any of the former, are easily transmitted to the latter. It is not, however, to be inferred from this circumstance, that the ganglionic system does not bestow sensibility, as well as motion, on the organs with which it is connected: but the exercise of such a function can scarcely be denied, as the lower gradations of animal life manifest sensibility, though they are destitute of cerebral nerves and a spinal cord, to which this phenomenon may be attributed

in the more perfect forms of organization. It is of little consequence, however, to the present enquiry, what opinion we entertain on this subject, as it is not likely that any one will be found to contend that the disordered sensibility of the ganglionic system is the occasion of cholera. The precise influence of sensibility in a morbid condition is difficult to determine. The property which endows the internal organs with contractility admits of less equivocal evidence, its mode of operation being more easy to be ascertained, and, when deranged, it appears calculated to produce considerable disease. Allowing that the ganglionic system is one source of contractile energy, it is utterly impossible to estimate the extent and mode of its operation in health or disease, and there may, too, be other sources as difficult to be estimated, such as the cerebral nerves, or some principle inherent in the contractile fibra itself,—powers, the influence of which we cannot calculate: the views and reasoning, then, of those who assert that cholera originates in a morbid state of the ganglionic system, must necessarily be either visionary, or imperfect. It is not in our power to determine in what manner the various secretions of the body are affected, either in health or disease, by the gan-

glionic system: experimental enquiries have, of late, tended to prove, that nervous energy has much less direct influence on the functions of life than was formerly imagined, these being shewn to be chiefly dependent on the proper qualities, and equable distribution of the blood. It may be contended by the advocates of nervous energy, that the disturbance of the vital fluid disorders the ganglionic system, and that the morbid effects observed are thus produced: but this is a mere assumption. The difference, then, between the two opinions under consideration is, that one confines itself to facts, simply stating that secretion is regulated by the blood, because this function is evidently more or less accurately performed, according to the existing properties of this fluid; the other asserts, on the contrary, that nervous energy is the important agent employed in secretion, but in support of this opinion, few cases are adduced in which a modification in the circulation or qualities of the vital fluid, is not an accompanying circumstance, which must, of course, interfere with the correctness of the opinion. Should we, however, even admit that the arguments in favour of the extensive influence of the ganglionic system have considerable force, it would be still diffi-

cult, if not impossible, to prove that derangement of this system is the cause of cholera.*

This disease, as previously stated, may be produced by a gradual deterioration of the vital powers, or at least, may occur, where it otherwise would not have done, unless such deterioration had taken place; in cases of this kind, at what stage of the symptoms would it be right to fix the disorder of the ganglionic system,—at the commencement of the slightest premonitory symptoms, or only when they have given rise to others characteristic of the formidable disease? At whatever period it may be fixed, there will be much co-existing derangement of the important organs of the body that must be shown to originate in disorder of the ganglionic system,

* On the obscure and perplexing subject of the pathology of cholera I have little to say. The lesion of the nervous system, which has been so generally assumed, I confess, appeared to me no where to exist. It was clear that neither the brain, nor the spinal chord, or their nerves, were peculiarly affected; and I could see as little proof that the gangliar system or the solar plexus was pre-eminently disordered. These organs, indeed, partake of the general lesion of the blood-vessels, in common with all others to which blood-vessels are distributed; but that they are specifically affected, is, I conceive, a hypothetical assumption entirely.—*Dr. Craigie, Edinburgh Medical and Surgical Journal.*

or the arguments in support of its extraordinary agency will be founded rather on assumptions than established facts.

Disturbance of the functions of the brain is considered by some writers, as the cause of cholera: but this opinion has been hastily formed without inquiry into the nature of the relations existing between that organ and the other vital powers, and there are, indeed, strong objections to it. The brain is not at all affected in the early premonitory symptoms, which are gradually preparing the way for those distinctive of the disease, and even when the latter exist to an appalling extent, the brain is at times only slightly disordered. There does not appear any necessary connexion whatever between the derangement of this organ, and the severe stage of cholera, which, however, there would most assuredly be, if they stood to each other in the relation of cause and effect. It cannot, moreover, be shewn that the brain is capable of exercising the kind of influence attributed to it: and, however powerful its influence may be in depressing the energies of life, it is not possible that the peculiar phenomena of this disease should arise from it. This organ operates on the animal system principally

through the respiratory apparatus, increasing or diminishing the ordinary changes of the blood in the lungs, and thus indirectly communicating its beneficial or injurious influence to the vital powers. The respiratory functions, however, do not appear at all disturbed in the premonitory symptoms, remaining unaffected till the later stages of the disease, when severe modifications are produced in the distribution of the circulating fluid; cholera cannot, therefore be justly considered as produced by the morbid action of the brain. It is scarcely necessary to make any additional remarks on this subject, as the fallacy or imperfection of the hypothesis which attributes this disease to any part of the nervous system will be necessarily still further exposed in attempting to give a more rational explanation of its origin.

If it appear, then, from these remarks, that cholera does not consist in an extraordinary affection of any part of the nervous system, what other views can explain, in a more satisfactory manner, its origin and nature? It will scarcely be denied, that the numerous morbid phenomena which occur are chiefly to be traced to, or at least co-exist

with, disturbance of the circulation and deterioration of the properties of the blood, and it is therefore necessary to determine the causes of such derangement. In the collapsed stage of the malady, the vital fluid is particularly *internal* in its distribution; the congestion induced is, however, in some cases less than might, perhaps, be imagined from the extraordinary depression of the sanguiferous system. The disease has been confined almost wholly to the most wretched amongst the lower classes of society, whose constitutions are extremely debilitated by poverty, dissipation, or a vitiated atmosphere, and the quantity of the circulating fluid, in such persons, is consequently much less than in others, possessed of vigorous health. The internal organs are nevertheless much congested, as proved by dissection. These may be affected in different degrees, as in fact they are, from circumstances which may be easily pointed out, *but the congestion will necessarily be general as the moving powers of the blood are disordered.* Supposing the whole of the animal system to be similarly healthy, or diseased, the circumstances which will influence the determination of blood to different organs, *will be their vicinity to the heart and the nature*

of the functions performed by them. The liver and the spleen, from their structure, admit of considerable accumulation of blood, but from their situation, even when the accumulation is only small, the flow of this fluid from the abdominal viscera to the chest is liable to be obstructed by it, and great congestion of these organs may therefore be produced, whenever the sanguiferous system is depressed. The lungs and the brain are very differently situated in this respect. The lungs from the nature of their functions, and their close connexion with the heart, are much less liable to congestion than the liver or the spleen, the motion of the blood in them being less controlled by causes which give this fluid an inward determination, than in either of the latter organs. The circulation in the brain is, also, much less liable to be disturbed than in these organs, not, however, so much in consequence of the brain being intimately associated with the heart, as *from its having no direct connexion by means of blood vessels, with the various important viscera of the body.* These circumstances, then, partly account for different degrees of congestion, occurring in different organs, on depression of the circulatory system : but other causes must be taken into consideration in explaining

the excessive engorgement of the abdominal viscera in cholera, dysentery, and some other diseases. Those parts of the system which have been some time disordered, before the blood becomes particularly internal in its circulation, are liable to be more congested than if they had been previously healthy, such disorder predisposing them to this condition. This is one principal cause, in conjunction with other causes, of the liver and the spleen becoming exceedingly deranged in cholera. In taking into consideration the influence which these organs exercise, simply in consequence of their enlargement, on some of the abdominal functions, it will be easy to account for a phenomenon which has hitherto been deemed inexplicable, or has been explained in a very unsatisfactory manner, viz., *the absence of bile in the alimentary canal.* This symptom always exists in the most severe and fatal cases, and has been supposed to arise from a spasmodic constriction of the bile-ducts.* "The first characteristic feature that occurs to us," ob-

* The most general attack seems to consist in a spasmodic affection of the stomach, duodenum, and more especially the biliary ducts (the total absence of bile in the matter voided upwards being, perhaps, the most uniform characteristic of the disease.)—*Reports on the Epidemic Cholera which has raged throughout Hindostan and the Peninsula of India, since August*, 1817.—*Bombay*, 1819.

serves MASON GOOD, "on a review of the disease, is the total absence of the bile from the whole range of the alimentary canal in every case, while this fluid was generally found in abundance in the gall-bladder; the general battery of symptoms appears, therefore, to have been opened by a spasmodic constriction of the bile-ducts; for without such an obstruction, we cannot account for an exclusion of all bile from the intestines."*

It is purely an assumption, to assert that such is the cause of the phenomenon, because it has never been shown that the bile-ducts are so affected, nor can such an inference be deduced, as certainly has been, from the co-existence of spasms in other parts of the body. *The bile is prevented from flowing into the intestinal canal by the great enlargement of the liver, which causes an undue pressure on the bile-ducts, arresting or impeding the current of this fluid; or by the natural relations between the duodenum and the gall-bladder being disturbed, so as to preclude the escaping of the bile; or the flow of this fluid may, perhaps, be occasionally obstructed from its thick and viscid nature.* It is admitted by every writer on this disease,

* Study of Medicine, Vol. 1, p. 316.

that the liver is considerably augmented in size,* sometimes even to so great a degree as to be ruptured, and it is, moreover, acknowledged, that in the milder cases of cholera, and whenever an improvement takes place in the symptoms of the more severe kinds, bile generally flows; a corroboration, as will shortly appear, of the explanation already given. Enlargement of the liver will undoubtedly cause it to occupy additional space in the abdominal cavity, not only in one, but in every direction, so that the natural relations, existing between

* The liver was invariably in a state of *engorgement*, from the black blood, which, in all states of it, freely oozed out from the hepatic veins, especially on incisions into its substance; it was in general discoloured, even after sponging the membrane covering it, and I think most so, in the younger subjects, and those who had not suffered from previous affections of it. The spleen was also in a state of *engorgement*, and of a black purple colour, and this independently of any alteration of its structure as referrable to other morbid states. —*Extract from Dr. Hamett's Medical Reports.*

The liver has been commonly, but not always found to be gorged with blood: it is usually an organ very vascular: and it would probably demand a nicer discrimination than has been bestowed upon the subject, to distinguish the degree of congestion in which it is naturally left by the settling of the blood after death, in ordinary diseases, from that which has been observed after an attack of cholera. The gall-bladder has almost universally been found to contain bile, and in the great majority of cases, even to be completely filled with it. As is usual with this secretion in cases of retention, it is of a dark colour. —*Report of the Madras Medical Board on Cholera.*

the gall-bladder and the duodenum, or the bile-ducts subjected to undue pressure, will be liable to be deranged, by which they will be rendered more or less impervious. Although it is difficult to determine the exact cause of this phenomenon, it will be allowed, that this explanation is more plausible and satisfactory than any which has been given. It has already been remarked, that in the milder cases of cholera, and on an amelioration taking place in the more severe cases, bile is found in the dejections. When the disease is comparatively mild, the engorgement of the internal organs is proportionately moderate, as this condition depends altogether on the degree of disturbance produced in the sanguiferous system. The liver in such cases, is, therefore, only slightly enlarged, and hence there is little, if any impediment to the flow of bile; and on an improvement, too, taking place in the severe forms of the disease, this organ, as a part of the animal system, will, of course, participate in the general amendment, and consequently no longer obstruct the passage of bile into the intestines.

This view of the subject explains the nature of the relations existing between the violence

of the disease and the entire absence of bile in the motions, as well as the partial appearance of this fluid in the milder forms of the malady, without having recourse to spasms, *which have never been shown to exist in the bile-ducts,* nor in any vessels, whatever be the nature of their functions.* The existence of spasms, in various muscles of the body, cannot be adduced as evidence to prove that the bile-ducts are thus affected; an opinion, however, which has been entertained without the slightest degree of probability. The spasms, occurring in this disease, have been thought to arise from derangement in the distribution of the nervous fluid, this being supposed to be extremely liable to unequal diffusion, or accumulation, in different organs. This notion has, indeed, been formally propounded, as if the nature and action of the nervous fluid were subjects fully ascertained. "With respect to spasms," observes DR. JOHNSON, "as they are totally unaccounted for by

* The gall-bladder contained the natural quantity of bile, of no very remarkable appearance. The gall-ducts were found pervious, the bile flowing readily into the duodenum on pressure being made on the gall-bladder. No unusual accumulation of bile existed in the ducts or their ramifications; but a small quantity of that fluid, of the healthy appearance, might be squeezed out of each of the pori biliarii. —*An Essay on the epidemic Cholera of India, by Reginald Orton, Surgeon of the 34th Regiment of foot,* 1831.

my predecessors, neither am I bound to dive into the mysteries of the nervous system for a solution of the phenomena. I think I have pretty clearly proved, that they are not attributable to bile; since in the most dangerous and fatal cases no bile is to be found. I can easily conceive that the brain must suffer from the broken balance of circulation, as well as from its known sympathies with the stomach and liver, and thus in some measure, account for the unequal distribution of nervous energy, which may excite cramps, and throw various classes of muscles into convulsive agitation."*

The functions of the lungs, the brain, the heart, and the stomach are disordered when the ordinary conditions of the sanguiferous system are severely disturbed, and, for any thing that we know to the contrary, the muscles may be similarly affected, so that the spasms they exhibit, may be defined *as depending on the unhealthy condition of the blood and its irregular distribution.* It must not, however, be inferred from these remarks, that the nervous fluid, or energy, is considered to be undisturbed, or that the violent muscular contractions are regarded as independent of it. It is only intended to

* Influence of Tropical Climates, p. 272.

shew, that the phenomena are explicable on this view without entering upon inquiries concerning the production, distribution, and operation of the nervous fluid. It may, perhaps, be objected, that, by thus confining the investigation to the conditions of the circulatory system, the spirit of scientific research is unjustly circumscribed; but if this objection has any meaning, it probably signifies no more than that by this rational mode of explanation, bounds are set to gratuitous assumptions and visionary speculations. When any one has shewn what the nervous fluid or energy is, and how its concentration or expenditure affects the muscles, so as to produce violent spasms, he may then be permitted to theorise on its influence, but certainly not before; and even such an explanation of the nature and effects of this fluid might be of no great practical value, since, from the constant co-existence of strong muscular contractions, and a striking derangement of the sanguiferous system, principles of treatment may, perhaps, be as justly deduced as from a more intimate acquaintance with the functions of the nervous system, which can be beneficially influenced in cholera and other congestive diseases, only through the circulatory apparatus, or in

other words, *by improving, the qualities and the distribution of the blood.* Spasms frequently occur in young females of delicate constitution and sedentary habits, particularly when the uterine functions are imperfectly performed, and, also, when these functions are ceasing to be required for the important purposes of nature. An examination of the vital powers, under these circumstances, will prove, that the circulation and the properties of the blood are disordered, and the remedies employed for the cure of these spasms, or of the diseases of which they form a part of the symptoms, *are beneficial in exact proportion as they tend to improve the conditions of the sanguiferous system.*

Spasms in cholera more generally affect the extremities and the muscles of the back than any other parts of the body, which arises from the circulation of the blood being in them exceedingly disturbed. The influence of the contractions of the heart is only slightly felt in these situations, so that when the vital fluid has a tendency to become internal in its distribution, the circulation of it in these situations will necessarily be first disordered and to the greatest extent. This fact is strongly

corroborative of the views I have taken of the cause of spasms. "In a large proportion," says Mr. ORTON, "there is no appearance of spasm in any part of the system. In many there is no purging; in some no vomiting; and, in others neither of these symptoms. I have already observed, that these last were by far the most dangerous cases, and that the patients, died under them in an hour or two; the nervous power appearing to be exhausted almost instantaneously, like the electric fluid from a Leyden jar. Mr. M'CABE, depôt surgeon, Poonamallee, informs me, that he has found the cases, which to common observation might appear the most desperate, those which were attended with spasms and retching of extreme violence, *actually amongst the most tractable:* an important fact, which my own experience fully confirms. Dr. BURRELL saved eighty-eight out of ninety of his later cases, meaning those of this kind, and in his general description of them, he says, "that the retching was constant, and the spasms so violent as to require six men to hold the patient on his cot." On the other hand, nothing can be more evident than the intractable and fatal nature of those cases, in which the pulse, instead of rising, sinks at once; in

which there are no spasms, and scarcely any vomiting or purging; and in which, not only the excretion of bile, but of all the secretions appears to be entirely suspended."* The violent spasms and the almost constant retching, and the more tractable nature of the disease, are phenomena on which the investigations of the physiologist have thrown little, if any light. That they are connected, as cause and effect, will scarcely be doubted, and a knowledge of some of the principles developed in the foregoing pages will go far towards elucidating the precise nature of their connexion. The spasms and retching have a common *tendency to arouse the circulation, and thereby to lessen the severity of the disease.* The spasms of the different muscles, and the great bodily exertion which is excited, as exemplified by the difficulty of holding the patient, cannot fail to effect important changes in the distribution of the blood, and consequently, lead to the happiest results. The frequent retching brings into violent action the whole respiratory apparatus, and in this way more directly influences the distribution and qualities of the blood than the simple contraction of muscles unconnected with the chest. It is, indeed,

* Study of Medicine. Vol. I. page 308.

distinctly stated, that the pulse acquires considerable force, or becomes more frequent and strong, during the operation of these causes.

When the muscular contractions do not exist, the vital powers sink, not in consequence of the nervous fluid being suddenly exhausted, as stated in the foregoing extract, but of the great oppression of those organs whose constant action is essential to life. This explanation satisfactorily accounts for the disease being more tractable when spasms and retching are more frequent, as well as for the greater fatality of those cases in which these symptoms exist not at all, or only partially. Delirium and insensibility occasionally characterise the worst forms of the disease, and it will scarcely be questioned that they arise from congestion or inflammation of the brain. The latter condition frequently succeeds the former. That this organ is variously diseased, under such circumstances, is clearly proved by post-mortem examinations.*

* On detaching the calvaria from the dura mater, the latter was, in most instances, spotted all over with the black blood that instantly issued from the torn vessels, especially along the lines of the sutures, where they are most numerous; in the younger subjects particularly. The external surface was mostly of a dark bluish colour, and dry, but

The morbid secretions in cholera are attributable to disordered conditions of the sanguiferous system. The functions of the secretory organs, whatever be their nature, are regulated by the qualities of the blood and the character of its distribution. It is an acknowledged fact, that, in the majority of instances, the unequivocal symptoms of this disease are preceded, sometimes many days, by derangement of the stomach and bowels, and, consequently, the secretory functions of these organs, on a still farther depression of the vital powers, are prepared to exhibit considerable disease. It is

clammy feel. The internal surface of the dura mater, and its processes, or continuations, were not marked by any peculiarity, except, perhaps, in the appearances being more opaque, and feeling more clammy than usual. The tunica arachnoidea was in general of a wheyey, glossy colour, and somewhat clammy to the touch. Between this membrane and the pia mater, and more especially in the lower part of the cerebellum, there was occasional effusion or filtration of serous fluid; and in all instances there was considerable effusion of this fluid between the pia mater and the cerebrum and the cerebellum both; in most instances it was found in the ventricles, in the fossulæ at the basis of the cranium; and, indeed, whenever this effusion between the tunica arachnoidea and pia mater and the brain itself at large, was observed, it was also invariably observed in the same relative situations in the spinal marrow of those bodies in which the spine was examined—which were fifteen in number. In other instances, too, where there was effusion of the brain, we had only to elevate the pelvis and loins in order to see serous fluid issue forth from the spine through the occipital foramen. There was always a considerable quantity of thin

difficult to determine the exact nature of their derangement. Some have supposed it to be inflammation, others a peculiar nervous affection. It appears to me, however, probable, *that it consists in congestion, and a degree of morbid irritability induced by the vitiated properties of blood, or, occasionally by various injesta.* It cannot, for a moment, be doubted, that the secretory follicles of these organs are capable of being thus affected, or that the condition of the sanguiferous system just described exists in cholera; and, therefore, the pathological view proposed does not rest altogether on as-

black blood in the sinuses, in the inferior more so particularly. In all cases the congestion of black blood in the veins of the pia mater, in the venæ galeni, and choroid plexus, was great, accompanied with varicose dilatation of these vessels; and likewise, the same relative congestion of black blood in the veins of the pia mater, in the spine, especially in the posterior parts of it, where these vessels, being larger and more numerous, varicose dilatation was more conspicuous. The medullary substance of the brain seemed in some instances much softer than usual, but it might have been owing, in part, to the interval elapsed, during hot weather, between death and the time of examination. In some instances, black spots were visible on incisions into the brain; at times, too, the cineritious and medullary substance both seemed relatively altered in appearance, as well as consistence. The state of the spinal marrow corresponded in all cases exactly with that of the brain.—*Extract from Medical Reports communicated to the Government, on the Cholera Morbus which prevailed at Dantzig, between the end of May, and first part of September,* 1831. *By John Hamett, M.D.*

sumptions. How often do we observe, in cases of debility, profuse perspiration, which may be shown to arise from deterioration in the properties of the blood, and diminution of tone in the superficial capillaries, in consequence of which the watery qualities of the vital fluid readily escape! The mucous surface of the alimentary canal is, it is most probable, similarly situated in cholera, and, on this principle, therefore, we may explain the copious discharge of rice-watery evacuations. It is difficult to say whether this extraordinary discharge of fluids be altogether the result of a secretory action, or a simple pouring out from the vessels. It is not possible to adduce decisive facts in favour of either opinion. The want of such evidence is not, however, of any practical importance, as greater accuracy of knowledge would not be likely to lead to the use of different remedies. The somewhat flocculent or turbid appearance of the matters evacuated both fron the stomach and bowels, may, perhaps, be attributed to the fluids, secreted or poured out from the vessels, being mixed with the various substances always existing in the alimentary canal, and arising from the exercise of the digestive process. The non-secretion of urine in this

disease is a very striking and characteristic symptom, and may be accounted for by taking into consideration, the morbid properties and disordered distribution of the blood. The function is often considerably interrupted in different diseases, in all of which it is easy to prove that the sanguiferous system is severely disturbed. The secretion of urine is, all things being equal, correctly performed *according to the properties of the vital fluid and the character of its circulation:* the entire cessation of this function in cholera is, then, by no means extraordinary or inexplicable. In the further investigation of this malady, the pathological principles already developed in this Chapter, will receive additional elucidation, and other matters, which have as yet been only slightly touched upon, will be more fully considered.

SECT. III.

Appearances on Dissection.

From the reasoning pursued in the foregoing pages, and the numerous facts on which it is founded, it is not difficult to conjecture what will be the general character of the morbid effects discovered on dissection. These, however, are of too much importance to be left to mere inference, as they tend strongly to establish the physiological principles laid down in the preceding pages. The serous membrane rarely exhibits any very decided traces of disorganization; but these are found in the mucous membrane, occasionally to a very great extent. The lungs are generally engorged with black blood, and often resemble in appearance the substance of the liver.*

* The lungs have not unfrequently been found in a natural state, even in cases where much oppression of respiration had existed previously to death. Much more generally, however, they have been fonnd either to be gorged with dark blood, so that they have lost their characteristic appearance, and have assumed more that of the liver, or

The heart and large vessels are also in a similarly morbid condition. The following minute description of the changes, observed in the abdominal organs, on dissection of those who have died of cholera, though not derived from the examination of cases which have occurred in this country, contains an excellent and faithful account of them : being the result of more extensive examination than my own opportunities have afforded, chiefly in consequence of

the spleen ; or they have been found to be in the opposite state, that is, collapsed into an extremely small bulk, and lying in the hollow on each side of the spine, leaving the cavity of the thorax nearly empty. This appearance has been so remarkable as to induce Dr. POLLOCK, of H. M. 53d regiment, to conceive that it could only be produced by the extrication of a gas within the cavity of the pleura, capable of overcoming the atmospheric pressure. It is understood, however, that opportunities were had of piercing the thorax of the dead body under water, and that no gas was extricated. As there appears to have been an absolute vacancy in the cavity of the pleura, that is to say, the lungs did not by any means fill it, it would seem that that viscus had exerted a contractile power, adequate to overcome the pressure of the atmosphere. The blood found in the lungs has been always very black. The heart and its larger vessels have been found to be distended with blood, but not so generally as the apparent feebleness of their propelling power, and the evident retreat of the blood to the centre, would have led us to expect. The right auricle and ventricle being gorged with blood is nothing peculiar to cholera ; but some dissections have shown the left cavities to be filled with *dark* or *black* blood, which we may reckon as a morbid appearance more peculiar to it.—*Report of the Madras Medical Board on Cholera.*

the strong prejudices existing in the minds of the lower classes of society, in this country, against dissections, particularly during the prevalence of an epidemic, of which they are mostly the victims. "Upon opening the abdomen, a peculiarly offensive odour, as remarked by Mr. JAMIESON, in his report of the Medical Board of the Bengal Presidency, respecting this disease, was sometimes observed, particularly in those who died suddenly. The *stomach* generally contained more or less of a watery, muddy, and sometimes grumous fluid. The colour of this fluid was various, sometimes it was colourless, at others greenish, or passing into a yellow tint, and in some cases it was brown, approaching to black. The peritoneal surface of the organ seldom presented any other appearance than a greater congestion of the veins than was natural. The mucous surface was sometimes covered by a dark coloured shining mucus, and when this was removed, considerable congestion of the venous capillaries was observed. This congestion seemed to be chiefly seated in the sub-mucous cellular membrane, and was occasionally so extensive in particular points, as to give the appearance of ecchymosis of this coat. The internal tunic was occasionally much corru-

gated, seemingly much thickened, and doughy to the touch, more especially when it was not much distended by fluid or flatus. The stomach was frequently flabby and relaxed, and its coats could be more easily penetrated by a harder body than usual. In those cases, in which some degree of re-action of the vital energies had taken place, the internal surface of this organ, particularly about the pylorus, presented a livelier colour, approaching to red, and was apparently thickened and contracted. The omentum was sometimes corrugated, or thrown to one side of the abdomen. The *small intestines* were, occasionally, more than usually constricted in parts, frequently distended by flatus, and their veins generally engorged with black blood ; externally, they presented a doughy thickened appearance, and their colour varied from a pale vermilion, through all the deeper shades, to a dark purplish hue ; the former being chiefly remarkable on the peritoneal surface of the duodenum and jejunum, the latter in the ileum, about where it terminates in the cæcum. These shades of colour appeared to arise from the different degrees of congestion in the capillaries and veins in different parts of the canal, from the injection of the arterial capillaries, and from

the colour of the blood which the vessels contained. When the small intestines were laid open, their coats seemed thickened, especially if the intestine was not distended, or if it was in any degree contracted, and they were frequently flabby and more easily torn than usual. The internal surface was generally found covered by a viscid, thick, and clay-coloured substance, which sometimes passed to a cream or yellowish tint. This was particularly remarked in those who died after a sudden and short attack of the disease. When this matter was removed the mucous coat itself was usually pale in the upper portion of the small intestines, and dark-coloured and congested in the lower part, particularly where the ileum is blue or purplish externally. When the disease was of longer continuance, and more particularly when some re-action of the powers of the system had taken place, this viscid appearance was detached to a greater or less extent, and was floating in the fluid contents of the small and large intestines; and the mucous coat then seemed more vascular, and the arte rial capillaries appeared more injected, than in the former class of cases. The *large intestines* were frequently contracted, sometimes they

were distended, and at others, they were both contracted and distended in different parts, in the same case. Congestion of the veins and venous capillaries was generally evident, especially of those seated in the cellular substance connecting the tunics. The external coat was generally dark-coloured, owing to the blackness of the blood in the congested vessels. The mucous surface was frequently very vascular; sometimes it presented a dark red colour, especially if the patient had lived for some time, and strong stimulants had been administered.

"These intestines never contained any fæces, and the fluids met with in them were generally similar to those found in the stomach and small intestines. — The *liver* was generally darker than natural, and loaded with black, thick blood. Sometimes this organ assumed a purplish, or dark blue colour, at other times it was mottled, enlarged, flabby, or pulpy, and easily torn. The *gall bladder* was always distended by thick viscid bile, which was generally of a dark-green or black colour, in subjects who died before the appearance of bile in the excretions, and although the hepatic

duct was large and permeable, the mouth of the common duct was generally constricted, and seldom permitted the bile to flow into the duodenum without considerable pressure made upon the gall bladder.

"In those cases which terminated fatally after an illness of long duration, and in which some re-action of the vital energies, and a flow of bile into the intestines, had taken place, the gall bladder was generally empty, or contained but a small quantity of healthy bile; and the common duct, although not always free from some degree of constriction, was generally more permeable than in the former class of cases. In a few instances the gall bladder was quite empty, relaxed, and flabby. In almost all the cases wherein bile was observed in the excretions, and the gall bladder was found empty on dissection, and consequently when it could be legitimately inferred that this secretion had passed into the intestines during the life of the patient, I remarked that the viscid matter usually found lining the mucous surface of the small intestines, in the former description of cases, was detached to a greater or less extent, and was either floating in the fluid contents of the larger intestines,

or entirely removed along with the matters which had been ejected from them."*

All authorities allow that the brain and thoracic organs are greatly congested. In the dissection of cases at Bombay, "not a single thoracic or abdominal organ was to be traced unmarked by vascular rupture, or turgescence of black blood, or unstamped with some other morbid appearance."† Many circumstances, such as the susceptibility of the constitution, the severity of the exciting cause, and the duration of the disease, will render the structural changes, discovered on dissection, so various, that no two cases will present the same exact degree of disorganization, yet those, occurring at the same time, and in the same situation, will strongly resemble each other in their general character. The disturbance of the laws which regulate the chemical changes in the lungs will satisfactorily explain the extraordinary modifications produced in the qualities of the vital fluid, which is stated to be extremely dark coloured, occasionally coagulating with difficulty, and sometimes not at all.‡

* Influence of Tropical Climates, 294. † Study of Medicine.

‡ No symptoms of cholera are so uniform in their appearance and

It has been supposed by many writers, that these phenomena arise from the exhaustion or dissipation of the nervous energy, or vital principles;—but such a supposition is by no means necessary to account for them. The properties of the blood are influenced chiefly by two circumstances:—*the quality and the quantity of the chyle produced, and the degree of its oxygenation.* The operation of these circumstances has already been considered, and the subject, therefore, requires no fur-

progress, as those connected with the blood, and its circulation. Although the reports, in general, afforded ample reference to this point, it still appeared to the Medical Board to be one of such importance in the pathology of the disease, that a circular letter was addressed to about thirty medical officers, who were supposed, from their experience in the treatment of it, to be best qualified to afford information. Attention was especially directed to the following considerations: first, the influence which the state of the blood, in those affected with cholera, might be supposed to have in producing some of the symptoms: second, the colour of the blood abstracted from a vein in a person affected with cholera: third, the colour of the blood after a certain quantity had been taken, and, the affect, which any alteration of colour might have on the condition of the patient: fourth, if arteriotomy had been practised, the colour of the arterial blood in cholera: and lastly, the period, from the first attack of the disease, at which blood was abstracted. It is established by the replies to this letter, as well as by an immense mass of concurrent evidence, that the blood of persons affected with cholera, is of an unnaturally dark colour and thick consistence. These appearances are very uniformly expressed by the terms dark, black, tarry, in regard to colour; and by thick, ropy, syrupy, semi-coagulated, in respect to its consistence.

ther elucidation. It is stated by Dr. Davy, that in some of the cases which he dissected at Ceylon, "there was a flaccidity of all the muscular parts, as in animals killed by electricity, or hunted to death. There was a tenderness of the muscular fibres; whilst, antecedently to death, as in many of the Bombay cases, there was no difference in the colour of the arterial and venous blood, and no instance of a buffy coat on the blood that was drawn, which in reality was so loose and uncoagulable,

The change in the condition of the blood is likewise fully proved to be in the ratio of the duration of the disease: the blood, at the commencement seeming to be nearly, or altogether natural, and more or less rapidly assuming a morbid state as the disease advances. Some very rare cases are recorded where, however, this morbid state of the blood was not observable, although the disease had been for some time established; and instances have occurred, where the blood flowed readily, sometimes little altered, where, nevertheless, death ultimately ensued. The abstraction of blood has been found by all practitioners to be very difficult and uncertain; and the uncertainty has been variously imputed to the feebleness of the circulation, to the thick consistence of the blood, and to the combined operation of these causes. The blood drawn from patients, suffering under cholera, is stated to be generally very destitute of serum, never to exhibit the appearance of buff, and to be generally disposed to coagulate quickly. Several instances, however, have occurred, where the coagulation was slow, and imperfect. A great majority of the reports state unequivocally, that after a certain quantity of dark and thick blood has been abstracted from a patient under cholera, it is usual for its colour to become lighter, its consistence less thick, and the circulation to revive: such appearances always affording grounds for a proportion-

that, when venesection was necessary, the vessels were opened with the greatest caution, from the difficulty of restraining the blood afterwards."*

It is also remarked, that the bodies of those who died of this disease, underwent the putrefactive process sooner than usual. These phenomena are accounted for by taking into consideration the gradual deterioration of the qualities of the blood, during the depression of the

ably favourable prognosis. In many instances, however, no such changes have been observed to accompany the operation of bleeding, while yet the result was favourable. The blood is generally found to be less changed in appearance, in those cases of cholera, which are ushered in with symptoms of excitement, than where the collapsed state of the system has occurred at an early period. The blood has been occasionally found, on dissection, to be of as dark a colour on the *left*, as on the *right* side of the heart; affording reason to believe that in the whole arterial system it was equally changed. The temporal artery having been frequently opened, the blood was found to be dark, and thick, like the venous blood: but it would appear, that this operation has not been performed in general, until the attempts to procure blood from the brachial or jugular veins had failed: little or no blood could be obtained, the artery merely emptying itself in a languid stream, not in a jet, and then collapsing. An instance is stated where the surgeon, despairing of other means, cut down upon the brachial artery, but so completely had the circulation failed, that no blood flowed. When re-action has been established, the blood occasionally shows the buffy coat.—*Report of the Madras Medical Board on Cholera.*

* Study of Medicine, vol. 1, p. 317.

powers of life. The healthy constitution of the muscular fibre, like every other part of the body, can be maintained only by blood possessed of properly oxygenated and nourishing qualities, and hence the change described as taking place in it is easily explained.*

* See Note A.

CHAP. II.

THE EXCITING CAUSES OF CHOLERA.

SECT. I.

The Influence of a Cold or Moist state of the Atmosphere.

BEFORE we enter upon the investigation of this subject, it may be well to make a few remarks on the predisposition which the animal system acquires, at different seasons, to particular diseases. It seems scarcely necessary to define what is intended by predisposition; but to prevent the possibility of a misapprehension of the term, I shall endeavour to affix to it a precise meaning. The animal system is so influenced by the changes of the seasons, as to receive from each a peculiar and distinctive character, which predisposes it to particular disorders. It has been shewn, in this work

in what way the frame is affected by heat, cold, and various kinds of living — circumstances, which, differing in each season, give rise to certain constitutional changes; as, for instance, *a more or less excited or vigorous condition of the vital powers.*

These changes, however, which explain, in many instances, the occurrence of inflammations, fevers, and other diseases, do not account for the prevalence of dysentery in the autumn of one year, of cholera in that of the next, or of typhus in the same season of the third. Though in these different years, the exciting causes of the malady are, apparently, the same, they yet produce different effects. This difference in the effects produced is generally referred, by medical writers, to a difference in the exciting causes.

That there may be a difference in the exciting causes, occasionally sufficiently great to produce morbid effects, unlike in character, is unquestionable; but regarding these causes, whether they be cold or heat, a dry or a moist atmosphere, food of any kind, or mental depression, as the direct agents of epidemical diseases, it appears to me most probable that

the nature of these diseases is determined chiefly by the existing predisposition of the system. A strong argument in favour of this opinion, may be drawn from the remarkable fact that, the same class of diseases is often occasioned by different causes. At a time when dysentery is prevalent, depression of spirits, indigestion, exposure to a current of cold air, drinking freely of water in a heated state of the body, will each produce this disease : *at such a time the vital powers have evidently a tendency, when disturbed, to evolve this disease in preference to any other*, and this seems to me the reason that the exciting causes just enumerated, though exceedingly different, produce the same effect. These various causes, are capable of occasioning the same general derangement of the animal system, viz., *depression of the circulatory powers, and consequent internal determination of the blood*, but how does it happen, that such general derangement produces in the same season, in successive years, epidemical diseases of a very dissimilar nature ? The peculiar state of the human frame, constituting a predisposition to any one of such diseases, I conceive it impossible to ascertain, as it depends most probably on modifications of the energies of life of too refined a descrip-

tion to be detected by any physiological analysis. Our ignorance of the nature of this predisposition does not, however, in the least degree, incapacitate us for investigating the operation of the exciting causes of the peculiar diseases to which it inclines, or the accuracy of the inferences to which such an investigation may lead, as it is not founded on merely speculative views, but on the observation of facts, wholly independent of any knowledge of the nature of this predisposition.

The very different circumstances under which cholera appears, is one cause of the great obscurity in which the nature and origin of this disease have hitherto been involved. It is found to prevail at all degrees of temperature; in a moist, as well as in a particularly dry state of the atmosphere. These phenomena have always been very perplexing to the enquirer, who, supposing this disease to have one invariable cause, has attempted in vain to discover it. Being thoroughly persuaded that this affection may be produced by various causes, it is my intention to shew how they severally act so as to produce the same effect. Cholera is much more frequent and severe in tropical climates than in any other,

which is attributable *to the greater susceptibility of the animal system, as well as to the more sudden vicissitudes of temperature in those climates*—circumstances which have often been generally alluded to, but never clearly and satisfactorily explained, no one having yet shown *in what the susceptibility consists, or the exact mode in which the vicissitudes of temperature affect the powers of life.* The burning heat of a tropical climate produces one evident effect, which is itself productive of many others —*a more highly oxygenated state of the sanguineous fluid.* It has been shown, in this work, that external heat promotes a more general diffusion of blood, and consequently facilitates the chemical changes in the lungs. Young children are much more easily chilled on exposure to cold than adults, and persons when warm than when possessing only their natural temperature,—phenomena which are sufficiently explained by the existing conditions of the circulatory system. In tropical regions the body is particularly stimulated, and, whilst in this state, is liable to be exposed, at the decline of day, to the refrigerating influence of a clear, cold, or moist atmosphere, or of winds blowing freshly from the ocean. The highly oxygenated qualities of the blood, arising from

the agency of external heat, will, undoubtedly, occasion extensive modifications in the nervous system, and in the secretory organs generally, but of the nature of these modifications, or the peculiar susceptibility they confer upon the body, it is not easy to form any exact notion. Though cholera has prevailed in every season of the year, and in almost every possible condition of the atmosphere, it is, however, generally allowed to be much more common at the latter end of summer, and at the commencement of autumn, than at any other period, which is to be ascribed to the frequent occurrence of sudden and severe alternations of temperature, at these seasons, acting on the *excited* system. Numerous observations prove that cholera, dysentery, and inflammation, often appear at these times in this country, and all of them may be traced to the same causes. When the weather has been particularly warm for several weeks, considerable disease is often observed to succeed any sudden change in the temperature, and it is often remarked, as extraordinary, that when the seasons alluded to are characterised by almost daily vicissitudes, severe diseases are by no means prevalent. The human frame, which is but slightly disturbed by changes

following each other so closely *as to constitute a series of uniform irregularities*, is very greatly disturbed by them, when a period elapses between each, sufficiently long to allow the animal system to be fully excited by the action of heat. When the vicissitudes are frequent, and indistinctly marked, the circulation cannot possibly acquire that *external* character which contributes so much to the acute susceptibility of the body. If cholera and dysentery occur here, at these seasons, in consequence of sudden changes of temperature, it is natural to suppose, that they will prevail to much greater extent in tropical regions where such changes are decidedly greater, and the constitution much more sensible to their influence. The following account of the state of the atmosphere and climate of Ceylon, where cholera sometimes breaks out to a fearful extent, is corroborative of these views :—" In no part of the globe does this terrific disorder assume a more concentrated state than on the coasts of Ceylon, especially its eastern side. The mountains tower to a great height in fantastic shapes or conical peaks, clothed from base to summit with almost impenetrable forests of lofty trees, underwood, and jungle. Deep vallies and ra-

vines, still more thickly covered with similar materials, and choked up, as it were, with all the wild exuberance of tropical vegetation, separate the mountains from each other, and swarm with myriads of animals and reptiles. From these vallies, in the months of May, June and July, when the S.W. monsoon is in force, the gusts of land-wind come down, hot and sultry by day, but chilling, cold, and damp by night. Where mountainous and woody, or flat, marshy and jungly tracts, border on the sea, atmospherical vicissitudes will, *cæteris paribus,* be greater than where the coast is flat and gravelly, or dry and cultivated. The reason is obvious. Thus the vicinity of Madras, for instance, being a sandy or gravelly soil, which, during the intense heat of the day, acquires a temperature, perhaps 60 or 70 degrees above that of the contiguous ocean, a considerable share of the night elapses before the heat of the earth sinks to an equilibrium with that of the water; and consequently we have seldom the land-wind cold there, except after falls of rain; and, on the contrary, in May and June, it is hot throughout the night. At Ceylon, on the other hand, the surface of the ground being so defended from the sun's rays by woods and

jungles, it never acquires any thing like the temperature of the opposite Coromandel coast; and although, during the months alluded to, when the south west monsoon passes with great strength over Ceylon, the wind by day being hot and sultry, as soon as the dews have fallen in the evening, and evaporation commences from a very extended surface, the land breeze is instantly rendered cold and raw; and being then loaded with vapour, together with all kinds of terrestrial and vegetable exhalations, communicates to our feelings and frames a chill, far exceeding what the thermometer would actually indicate. The same remark applies to Bombay; but in Bengal there are no regular sea and land-breezes, consequently the changes of temperature are not so abrupt and extensive as in the before mentioned places."*

It frequently happens, that a moist state of the air co-exists with considerable cold, and, when such is the case, the system is liable to be severely affected. The cold humid atmosphere abstracts heat from the body, and depresses directly the superficial capillaries, creating great disturbance of the sanguiferous

* Influence of Tropical Climates, p. 267

system. It is remarked by writers on diseases of the army, and by PRINGLE* in particular, that cholera, dysentery, and bilious fevers, are almost certain to succeed sudden cold combined with moisture. They suppose that the function of perspiration is arrested, or very much disordered, in consequence of which, these diseases are produced, without, apparently, being aware that such a derangement would be the effect of a previous change, *viz. a modification in the distribution of the blood.* When the generation of animal heat is great, the process of perspiration is proportionately active, and when the chemical changes are impeded by internal congestion, it is proportionately lessened or disordered. Indeed it necessarily follows, since this function is regulated by the qualities and distribution of the blood, that it will be disturbed whenever the natural conditions of the circulatory system are affected. If the constitution, in a highly excited state, were exposed for sometime to cold and moisture, cholera, dysentery, or inflammatory affections, would, perhaps, immediately occur; but the same causes would not produce the same effects, if the animal frame

* Observations on Diseases of the Army in Camp and Garrison.—p. 10, 20, 73, 79, 182.

were possessed of other vital conditions. Many facts might be adduced in support of this opinion. The determination of blood to the internal organs retards, of course, its chemical changes in the lungs, and this satisfactorily accounts for its deterioration, a phenomenon which Dr. JOHNSON considers inexplicable,* and which is explained in the following fanciful manner, by Mr. ANNESLEY :—"From these facts and considerations, therefore, I am led to conclude, that either the absence of electricity from the human body, or some important changes in its electrical state, arising, perhaps, from exposure to a negative electrical atmosphere, may be the cause of the dreadful and destructive epidemic which has frequently ravaged the East, and that the vicissitudes of the seasons preceding this formidable visitation, may support this opinion. If, therefore, this view of the subject be

* In reviewing the work of Mr. Annesley, he observes, "our author first adverts to the proximate cause, which, as may be anticipated from the foregoing sentiments, he conceives to consist in a singular and sudden change in the 'circulating fluid' as evinced by the venous congestion, and the black viscid state of the blood. This change, he thinks, and not unreasonably, must be "the effect of some uncommon influence over the vital powers." But what is this influence, and how does it effect these changes in the blood? This is the question, but who can answer it?—*Influence of Tropical Climates*, *p.* 29.

correct, we may readily account for the sudden attacks of the disease, the changes in the temperature and sensibility of the body, and in the fluids, which changes seem chiefly to characterise it, and for the manner in which it has been limited to some districts, extended to others, and has successively ravaged all." This view, as it affords something like an explanation of various phenomena, has frequently been adverted to by others, but it is necessary to remark, that the assumptions involved in it are purely gratuitous; and were it, indeed, partially supported by facts, it would still be insufficient to account for the origin of the disease under circumstances very different from those which are here supposed invariably to exist. There can be no doubt that various causes, and not any one in particular, are capable of producing it, and in explaining in what manner each exercises its particular power, it will, perhaps be admitted, that the appearance of the disease, at different seasons, and under circumstances very dissimilar, is not so extraordinary, or inexplicable, as some have imagined. It is not necessary to waste any time in attempting to show, that cold alone sometimes occasions the disease. The fact will scarcely be disputed, though

some are disposed to attach an almost exclusive importance to the influence of a particular miasm or condition of the atmosphere. It cannot be denied, that, whenever the animal system possesses those susceptibilities which have been alluded to, and is exposed to sudden alternations of temperature, the blood will be determined to the internal organs in considerable quantity, and that in all such cases, cholera, dysentery, or inflammatory affections, will be liable to ensue in consequence of this state of the vital fluid.

The increased secretion of bile is regarded by some as the cause of cholera. In the milder cases of the disease it is occasionally found in abundance in the alvine evacuations, as well as in the ejections of the stomach, but it is altogether absent in the severe forms of it. Its non-existence in the alimentary canal when the gall-bladder is distended by it, has been supposed in the foregoing pages, to arise from the enlargement of the liver, which presses upon the bile-ducts, or otherwise disturbs the natural relations existing between them and the duodenum, or, perhaps, occasionally from the thick and viscid nature of the fluid itself, rendering its escape difficult, or

impossible. The disease, in this town, was extremely general, and virulent in its nature, in the cold, wet, and cheerless days of September and October, particularly in situations naturally low and filthy, or where water and dirt were accumulated from other circumstances. The malady, indeed, was almost altogether confined to such situations during the whole period of its visitation, whether the atmosphere were dry and moist, warm or cold. It occasionally appeared, as if the fall of rain very much augmented the number of cases, and this may, perhaps, be explained by taking into consideration the influence of several causes. In places where the streets are well paved, or have a descent sufficient to allow the water to flow away, the fall of rain renders them much more salubrious, but where, from being unimportant, or only just formed, they are constantly in a filthy condition, the rain aggravates the evil. If they are low, offensive matters of every description are conveyed to them from more elevated situations; and, if they are not sufficiently low to be thus affected, they become more unhealthy from increased decomposition of animal and vegetable substances, or simply from the greater disengagement of them. Few persons can

have frequently visited such places, after the fall of rain, without perceiving the atmosphere to be infected in a manner disagreeable to the organ of smell. Though there may not be at this time great heat to promote decomposition and exhalation, it will not, however, be doubted, that rain, from converting many solid bodies into fluids, and agitating and mixing these, will be likely to increase the disengagement of offensive matters, but whether from exciting additional chemical changes in them, or only from disturbing their physical relations, it is, perhaps, not easy to determine. Moreover those who are resident in such situations, are, from defective living and clothing, very liable to be influenced by the inclemency of the season, altogether independently of the local circumstances, unless they may have predisposed the body to disease.

SECT. II.

The Influence of a Morbific State of the Atmosphere, principally arising from the action of heat.

In the preceding section it is stated, that peculiar susceptibilities of the system, admitting of explanation, as well as a certain constitutional predisposition, often involved in obscurity, must co-exist with the depressing effects of a cold and moist atmosphere to produce cholera in an epidemic form, spreading far and wide its dreadful ravages. The disease frequently appears when it is not possible to trace it to the action of these causes alone, and it is therefore necessary to enquire what other agents may be concerned in its production. The properties of the atmosphere are continually modified by the vegeto-animal decompositions on the surface of the earth, occasioned by heat and moisture, in consequence of which the chemical changes of the

blood in the lungs are at times extremely liable to be greatly disturbed. The following interesting case shews how easily these important changes are modified or interrupted, by the action of impure air :—

"An American merchant-ship was lying at anchor in Wampoa Roads, sixteen miles from Canton; one of the crew died of dysentery; he was taken on shore to be buried. No disease of any kind had occurred in the ship from her departure from America till her arrival in the river Tigris. Four men accompanied the corpse, and two of them began to dig a grave. Unfortunately they hit upon a spot where a human body had been buried about two or three months previously, as was afterwards ascertained. The instant the spade went through the lid of the coffin, a most dreadful effluvium issued forth, and the two men fell down, nearly lifeless. It was with the greatest difficulty their companions could approach near enough to drag them from the spot, and fill up the place with earth. The two men now recovered a little, and, with assistance, reached the boat and returned on board. On the succeeding morning they were visited by an assistant surgeon from an English Indiaman, in the Roads, who

reported the following symptoms: viz., very acute headache, with a sense of giddiness and dimness of sight, (which had existed, more or less, from the moment of opening the grave) eyes of a peculiar muddy appearance, resembling that generally observed in cases of Indian cholera—oppression about the præcordia, dull heavy pain in the regions of the heart and liver, with slight palpitations at times, and fluttering pulse, sense of extreme debility, with occasional convulsive and spasmodic twitchings of the muscles of the lower extremities, nausea, slight diarrhœa, rigors succeeded by flushings of the face, neck, breast, and upper extremities, tongue white and much loaded, pulse from 110 to 120, weak and irregular, urine scanty and high coloured, skin sometimes dry, and sometimes covered with a clammy sweat. On the fourth day from the commencement of the attack, numerous petechiæ over the breast and arms, and in one of the patients a large bubo formed in the right groin, and another in the axilla of the same side, which speedily ran on to suppuration. To one, the disease proved fatal on the evening of the fourth day—to the other, on the morning of the fifth. For two days previous to death, the gums bled freely.

The symptoms were so completely similar in both cases, that it is needless to repeat them here."* The symptoms in such cases, as well as the appearances on dissection, are produced by the immediate deterioration of the blood, consequent on the inhalation of the poisonous effluvium, or by this exercising, from its absorption and general diffusion, a baneful influence on the whole of the vital powers:—both causes, most probably, co-operate in the production of the morbid effects. The changes in the composition of the atmosphere, however great, cannot be considered as occasioning such a degree of deterioration in its vital properties, as to render it as injurious to the energies of life, as a concentrated and poisonous gas emitted from a coffin or common sewer; but though they differ widely in degree of virulence, their mode of operation is precisely the same. It is, therefore, easy, according to this view of the subject, to account for the origin of many diseases, generally regarded as contagious, such as cholera and dysentery, bilious and typhus fevers. Instead of supposing these to arise from one specific cause alone, or, in other words, from a state of the atmosphere, that must necessarily

* Influence of Tropical Climates, p. 21.

produce one of these diseases, it seems much more rational to attribute the various morbid effects, *to different conditions of the atmosphere acting on different co-existing susceptibilities of the animal system,* or even to the same atmospherical conditions acting on different susceptibilities. When the human frame has been much excited by long exposure to heat, a sudden transition to cold gives rise, perhaps, to cholera, whereas, if a greater or less degree of previous excitement had existed, it might have produced dysentery, bilious or typhus fever, &c. It is difficult to prove that such modifications of disease are the consequence of the causes here specified: the great probability, however, of their being such, can scarcely be denied, and the inferences drawn from this supposition appear fair and legitimate. Whatever opinion be entertained on this subject, it is impossible to doubt the fact, *that the properties of the atmosphere are occasionally very much deteriorated by the action of heat, which promotes decomposition of animal and vegetable matter, and causes abundant exhalations, and that such deterioration necessarily disorders the sanguiferous system.* In the fever of Cadiz, of the year 1800, Sir JAMES FELLOWES, who entertains the same views on this subject as Dr. PYM, asserts

that it was "not only contagious and propagated by contagion, but that the air, from its stagnant state, became so vitiated that its noxious qualities affected even animals; canary birds died with blood issuing from their bills, and in all the neighbouring towns, which were afterwards infested, no sparrow ever appeared."* "I do not remember," observes GOOD, "to have seen this last fact so directly affirmed by any modern writer, but it is not contradicted in the course of the controversy, and is in perfect coincidence with the state of the air during the plague in most places,† and particularly at Athens, as described by THUCYDIDES." The attacks of cholera are certainly sometimes so severe as immediately to depress the powers of life, as if the vital or nervous energy of the system were suddenly exhausted, though this effect, as before remarked, is produced by the vast accumulation of blood in the internal organs. The disease has at times occurred when there was no evidence to prove that it was the effect of violent atmospherical vicissitudes, or

* Reports of the Pestilential Disorder of Andalusia, which appeared at Cadiz in the years 1800, 1809, 1810, 1813, &c.

† Diemerbr de Peste. Cap. VI. Van Swieten, ex prof. Sorbait in. Sect. 1407. Vide Study of Medicine. Vol II. p. 93.

of the influence of winds or contagion, having been often found to prevail during the partial fall of rains, and the simultaneous or subsequent action of heat—circumstances, however well calculated to promote a rapid decomposition of animal and vegetable matters, and consequently to generate atmospherical impurities.

"It is remarkable," observes Dr. PRINGLE, "that pestilential diseases have frequently occurred in dry and hot summers, and, agreeably to this, I have observed, that the most sickly seasons in the field have been attended with the greatest heat and the least rain." In another place, speaking of the air and diseases of the low countries, he remarks, "according to the various degrees of heat and moisture of the season, the epidemics begin earlier or later, are of longer or shorter duration, and attended with milder or more alarming symptoms."* If, then, it be acknowledged, that the properties of the atmosphere are thus liable to deterioration, it is easy to conceive such a degree of it in tropical climates as to produce a highly vitiated state of the blood, to which must be attributed all the symptoms characteristic of cholera, these being pretty nearly the same,

* Opus Supra Cit.

whether caused by the sudden application of cold, or an impure condition of the air.

This disease has often appeared during the prevalence of great heat, and, according to the explanation here given of its operation, such an occurrence is by no means extraordinary. It rarely, however, breaks out in a highly virulent form, except in situations which are particularly unhealthy from the accumulation of filth, or the want of a free circulation of air: hence it is most commonly found among the most wretched of society in the old and badly constructed parts of a town, or in the vicinity of stagnant pools, or unwholesome water. Every observer of the ravages of cholera acknowledges that such is the case. It will then, perhaps, be allowed, that the deterioration of the atmosphere, by the action of heat on animal and vegetable matters, is not only one cause of cholera, but alone capable of producing it to a fearful extent. The same cause will also produce other diseases, such as typhus and bilious fevers; the nature of the prevailing malady, as before remarked, being chiefly determined by the co-existing predisposition of the animal system.

SECT. III.

The Influence of deteriorated properties of Air arising from Respiration, and the Exhalations and Secretions of the Body.

CONTAGIOUS diseases are frequently traced to the inhabitants of small and filthy dwellings, in confined situations, where the air is necessarily rendered noxious by the generation of numerous effluvia. As such diseases often undoubtedly arise from these circumstances, it will perhaps be admitted, that cholera itself may occasionally have the same origin. This disease is chiefly distinguished from dysentery, bilious, and other malignant fevers, by its greater degree of internal congestion or exhaustion of the vital fluids: the truth, however, of this assertion cannot be fully appreciated, till the diseases, with which it is compared, have been severally investigated. In the small, filthy, and ill-ventilated dwellings of the most wretched class of society the air is extremely unwholesome. I have

often visited such places in Edinburgh, Newcastle, and Sunderland, on which occasions I have found the air in the miserable hovels where pestilence raged, so offensive to the organ of smell, and so deleterious in its nature, as to cause nausea and severe head-ache. The constant breathing of such deleterious air will necessarily disorder the body unless its injurious agency be counteracted by causes which strongly invigorate the vital powers.

The air, in such places, is not only deteriorated during the visitation of epidemical diseases, but also when these do not prevail, and at all seasons of the year, though of course, in the highest degree when the general state of the atmosphere is unhealthy. It will then perhaps be admitted, that this cause may be sufficient to produce cholera, acting on the animal system predisposed to this disease. In alluding, in the foregoing pages, to the operation of other exciting causes, it was stated, that a certain predisposition must also exist, the origin and nature of which cannot be fully understood. Many writers on this dreadful malady affirm, that some places, though surrounded by houses in which it prevailed with great virulence, escaped its ravages

in consequence of no *direct intercourse being maintained between the inhabitants of such houses and those in the immediate vicinity.* This important inference, however, cannot be legitimately deduced from the non-intercourse between the persons living in the healthy and infected places, without first clearly shewing that they were in all respects similarly circumstanced; *that their living, clothing, and habits were the same; their dwellings equally spacious and well ventilated, and equally remote from every species of filth and nuisance*: but this entire similarity in the situation and circumstances of the infected and uninfected places has not been proved, or even asserted by any writer on the subject of cholera.

It has been stated, in corroboration of the above inference, that the soldiers in the barracks, at Sunderland, were not affected by the malady, though they were in the immediate vicinity of its ravages; but these soldiers were very differently situated, in many important respects, from the poor and destitute inhabitants in the neighbourhood of the barracks. The former, as is always the case in the army, were well clothed and fed, necessarily temperate and regular in their habits, taking daily

and moderate exercise, and sleeping in rooms cleanly and well ventilated: very different, however, were the condition, mode of living, and habits of the latter, who possessed scarcely any of these advantages, as I can affirm on my own personal observation, having attended many cases of cholera amongst them. Of the evil effects, arising from the breathing of air deteriorated by the exhalations of the body, and the function of respiration, many striking facts might be adduced.

The dreadful and well known fevers which have occasionally appeared in prisons, both in this and other countries, *are acknowledged to have generally originated in the great impurities of the air inspired in such confined situations.* It is often, moreover, remarked that persons coming from the country are more susceptible of any contagion prevailing in a town than the inhabitants themselves, which may, perhaps, arise from the lungs of those who are resident in the country, having been long habituated to a pure and wholesome air, and consequently being more liable to be affected by the epidemic-creating atmosphere of a town. It might, however, be supposed, that the constitutions of persons living in the country, being gene-

rally distinguished by greater vital energy than those of the labouring classes in manufacturing towns, would be *better calculated to resist the depressing influence of an impure atmosphere*—especially as it is an incontrovertible fact, that the more robust of the latter display much less susceptibility of contagion, whatever be its nature, than the weakly, or imperfectly nourished, owing, probably, *altogether to their possessing more highly invigorated powers of life*: but between robust individuals, residing in towns and in the country, there is this great difference, that the former are habituated to a certain degree of impurity in the atmosphere, to which the latter are not, and hence it is not improbable that the nervous system of country residents may be particularly sensible of the deteriorated properties of air in close and filthy situations during the ravages of pestilence.

SECT. IV.

The Influence of the Mind.

ANY enumeration of the causes which, either separately or conjointly, give rise to cholera, would be incomplete, unless it included *mental agency*, as this is undoubtedly both an exciting and predisposing cause. Its predisposing influence is manifested, to an alarming extent, wherever the ravages of the disease appear. It is not, however, improbable, that in many of those cases in which it has been supposed to exert only such an influence, it has also been an exciting cause. It has been stated, in the foregoing pages, that the animal system, during the prevalence of cholera, whether in this or any other country, *possesses a peculiar condition which gives it a predisposition to this disease.* According to this view, it will be admitted, that great depression of mind, by enfeebling the vital powers, may be an exciting cause, since it occasionally tends, as strongly as severe cold,

or atmospherical impurities, to produce an extraordinary depression of the energies of life.

It is certainly impossible to determine the exact cause of the malady among the hundreds who may die of it around us. In one it may be unwholeseme food; in another, the inhalation of impure air; in a third, long exposure to a moist atmosphere; in a fourth, sudden alternations of temperature; in a fifth, food difficult of digestion; and in a sixth, mental influence. All these causes are in operation among the multitude who are peculiarly liable to the attacks of this disease; but as they are apparent only in a few individual cases, *this epidemic has been commonly regarded as the product of some one cause alone.* I by no means intend to deny, that there may be some one cause in operation, much more powerful than any other, or, indeed, than all the rest together, which may give rise to this affection, but even this one cause may vary greatly in different climates or situations.

Had it not been discovered in what way the mind affects the body, it would have been impossible to give any thing like a clear and satis-

factory account of the manner in which it often gives rise to this or any other formidable disease. The principles which explain this phenomenon, shew that all the causes just mentioned are capable of producing the very same disease, because they occasion the same extensive changes in the properties and circulation of the blood, and through them affect the whole animal economy. The following is an excellent illustration of the influence of disappointed feelings on the animal economy :—

"His Majesty's ship, Russell, (74) sailed from Madras on the 22d October, 1826, and arrived at Batavia on the 29th November ; the crew healthy, and their minds elated with sanguine expectations of surprising the Dutch squadrons there. Such, however, was their sudden disappointment, and concomitant mental dejection, on missing the object of their hopes, that they began immediately to fall ill, ten, twelve, or fourteen per day, till nearly 200 were laid up with *scurvy*, scorbutic fluxes, and hepatic complaints ! Of these, upwards of 30 died before they were brought back to Bombay, and more than 50 were sent to the hospital there. The Albion did not fare better. —The Powerful fared worse : so that in these

three ships only, in the short space of a few months, *full one hundred men died on board*, and double that number were sent to hospitals, many of whom afterwards fell victims to the diseases specified; aggravated, and in a great measure engendered, by mental despondency." *

Were it necessary, many more such facts might be brought forward in illustration of the great influence of depressing emotions on the system, which are familiar to all acquainted with history. Many striking causes of cholera occurred during the ravages of the epidemic in this country, produced, apparently, by no other cause than fear. If this emotion gives rise to the same extent of congestion as the vicissitudes of temperature, or the inhalation of impure air, similar derangements will, of course, be observed throughout the whole system—such as great engorgement of the abdominal and thoracic viscera; diminution in the production of animal heat; a frequent, small, and almost imperceptible pulse, cold extremities, and evident deterioration of the properties of the blood. Should these modifications occur when

* Influence of Tropical Climates, &c. p. 100.

the susceptibilities of the human frame are acute, there is every probability that the particular symptoms, characteristic of cholera, will appear. The spasms, nausea, retching and vomiting, the morbid secretions of the stomach and alimentary canal, are not the effects of any peculiar miasm, but are really occasioned by the vitiated properties of the blood, and its disordered circulation. Great depression of mind is in many instances, undoubtedly, the principal cause of these symptoms, but even when they are thus produced, their injurious tendency is generally rendered much more detrimental by the co-operation of other agents, which individually, when severe, are capable of originating the disease. It is scarcely possible to conceive that contagious diseases are ever extensively propagated, without their diffusion being more or less facilitated by the simultaneous action of different causes, which are almost necessarily co-existent with the dissemination of such diseases.

CHAP. III.

THE MODE IN WHICH CHOLERA IS PROPAGATED.

SECT. I.

The Influence of those States of the Atmosphere which have produced it.

THE extensive dissemination of contagious diseases through a wide district of country, has generally been explained by the supposed existence and action of a peculiar miasm in the atmosphere; and though it has often been remarked that cholera, yellow fever, and other epidemics, after having prevailed a short time in one situation, frequently appear in other places altogether unconnected with the spot on which they originated,—notwithstanding this striking fact, it has been supposed that the miasmic matter has been communicated by the atmosphere from the original fount to these

distant or insulated places. The phenomena may, however, be accounted for on other, and, in my opinion, much more rational principles.

If the situation where the disease first breaks out be considered as its focus, the liability of individuals becoming affected, ought to diminish with the ratio of the distance; it often happens, however, that places very remote from the focus of the disease are suddenly attacked by it, not, as might naturally be supposed, from the small quantity of miasmic matter communicated, in a mild and gentle, but in a most severe and appalling form. Admitting, that the epidemic, in such places, generally manifests, at its commencement, much less severity, this circumstance alone is no proof that its comparative mildness is owing to the *gradual* introduction of a poisonous agent by the atmosphere from some infected district.

Dr. Good, in speaking of the course of cholera, observes, that "the disease instead of spreading from a centre to a circumference, or following the course of the wind, or of the sun, or obeying any other meteorological power,

marched, by a chain of posts, often in direct opposition to all kind of atmospherical influence, and in the immediate track of human intercourse. It often fought its way in the teeth of the most powerful monsoons, and left untouched various districts bordering on its career, and whose less salubrious features seemed to invite an acquaintance with it. It appeared, also, and vanished in all the changes of the moon, and in all states of atmospheric electricity; and at sea as well as at land. Mr. CORBYN, indeed, gives an account of its having made an attack upon the Lascars of an Indiaman, in its passage from England to the Cape of Good Hope, in 1814, and that, too, when the weather was *intensely* cold."*

The irregular and extraordinary appearance of this disease, may, in a great measure, be explained by taking into consideration *the simultaneous operation of the same, or different, causes in situations associated by no imaginable circumstance.*

When summer has been excessively hot, the whole of any single continent, or hemisphere, will experience the same general

* Study of Medicine. Vol. I. page 311.

modifications, and if one part of it is the seat of any epidemic, from such modifications having been produced on the surface of the earth, and in the constitution of the animal system, other parts will, consequently, be liable to be affected by it, in the same proportion as other concurring causes approximate. Or should the same vicissitudes of temperature prevail, for any length of time, the disease may break out in different districts successively, as if, having first originated in one, it was gradually propagated to the rest, when each may, in reality, possess the power of generating it. We may thus easily explain the striking and peculiar irregularities in the appearance of the disease—such as its keeping to a certain line of posts, its passing over many, without in the least infecting them, and its acting altogether independently of the course of the winds, or any other natural barriers to its progress. When cholera, after having raged for several months in one district, has almost entirely subsided, it breaks out, at times, with great violence in others situated at a very considerable distance from the first, and under circumstances quite different from those which seem to have been the original cause of it. Hence,

it would appear, that the disease has not been communicated by the slow process of contact, the distance between the places infected, or the nature of their situation, rendering this supposition highly improbable; nor by means of the atmosphere, not having been excited when this was in its highest state of impurity, if the severe and extensive ravages of the malady, in the districts which it first invaded, be a just criterion of the state of the atmosphere in those which were attacked at a later period. These difficulties, however, have been ingeniously attempted to be solved by supposing that the miasmic matter, after having lain dormant for some months, being again called into vigorous action, overruns those countries which it left untouched before. The disease, in the first instance, perhaps, prevailed when the weather was extremely sultry and hot; in the second, during sudden alternations of temperature, intense cold, or long continued rains. It is altogether gratuitous to assert that the miasmic matter exists during the interval of repose; but even allowing, for the sake of argument, that it does, is it not somewhat remarkable, that it should be revived, and should exercise its destructive influence, in

situations, and under conditions, so unlike those in which it originally displayed great virulence?

It seems most reasonable to consider its re-appearance as the consequence of other causes, or of the same, characterised by a purely local origin. In the passage quoted from Dr. GOOD, the disease is said to have "marched in the immediate track of human intercourse," and in that from Dr. JOHNSON, "through large cities here it made a regular progress; but it was otherwise in the more thinly peopled portions of the country." Whether the production of cholera be referred to alternations of temperature, or to contagious matter floating in the air, it is necessary to consider the influence of other causes, though only of secondary importance. Where great numbers of human beings are congregated together, the air habitually breathed is somewhat vitiated in its properties, by which the animal system is debilitated, as well as by other circumstances inseparable from thickly populated places: hence it is not extraordinary that the disease should appear "in the immediate track of human intercourse," or in large cities, while less crowded situations are comparatively free from it.

When cholera is endemic, or sporadic, it arises either from peculiar local circumstances, or the acute sensibility of only a few individuals: but, when it is epidemic, the causes in operation are not partial, but general. The observations which have been made with respect to the origin and propagation of this disease will also apply to the plague, to yellow fever, and to dysentery. A distinction has frequently been made between the respective properties of human and marshy effluvia. The former is considered as extending only to a few feet from its source, and as depressing especially the nervous system. The latter is correctly regarded as considerably less limited in its range, though it is perhaps much more circumscribed than is generally imagined.

Sir GILBERT BLANE informs us that the crews of the ships in the road of Flushing were exempt from the destructive epidemic of the country; from which fact it may be inferred that a locally morbid condition of the atmosphere is incapable of exercising an injurious agency to any considerable distance: indeed, the supposition that it does exercise such a remote agency, amounts, in my opinion, almost to an absurdity, *because the vitiated por-*

tion of air is so extensively diluted by its boundless diffusion, that it cannot possibly give rise to effects analogous to those produced by it in a state of concentration, or where it originates. Were such effects, however, produced by the morbid atmosphere at a distance from the source of its pestilential qualities, how could persons possibly exist in the immediate neighbourhood of their origin? The distinction which is commonly made between the action of marshy and human effluvia is by no means correct as a general principle. It is impossible to reason with accuracy on this subject, until we have clearly and fully ascertained the functions of the nervous system, and the indications of their derangement, with which we are at present but very partially acquainted.

SECT. II.

The influence of the deteriorated properties of respired air, and the morbid secretions of the body.

I HAVE endeavoured to shew, in the preceding section, that the propagation of cholera is more satisfactorily accounted for on the supposed co-existence and action of the same, or dissimilar causes, in different situations, unconnected by any appreciable circumstance, than on the generally received opinion that it arises from the transmission of a peculiar miasm from district to district, or from human intercourse. It is too obvious to require any illustration, that the expired air and cuticular secretions, will vary in their qualities according to the degree of health possessed by the system. The morbid matter, thrown off from the lungs and skin in this malady, differs, it is reasonable to suppose, from that evolved in other affections, only in the degree of its dete-

rioration, which is subject to infinite variations in the same class of diseases.

It will not always and invariably produce cholera, even when it communicates its injurious influence, occasionally causing nothing more than a simple derangement of the system. *The striking differences which accompany its operation, arise from the degree of its virulence, and the various co-existing conditions or susceptibilities of the body.* This disease is found to be most frequent and severe in the lower ranks of life, and in the worst ventilated places; the constitution in such situations, where the air is rendered particularly unwholesome by the constant admixture of filthy exhalations, being often debilitated by numberless irregularities. It is, as before remarked, on account of circumstances such as these, that epidemics are generally so prevalent and fatal in camps, jails, and crowded situations. It is clear, then, that the deteriorated properties of respired air, and the morbid secretions of the body must be ranked among the most active causes tending to propagate this disease, and it may therefore be truly regarded, according to this view of its origin, as contagious. It has already been observed, that the vitiated at-

mosphere, which surrounds patients in pestilential fevers, extends only to a short distance from the infected body. It is, impossible to ascertain its exact boundary, if, indeed, it possesses any such boundary; for, even allowing the effluvium to be heavier than common air, it is continually agitated by bodies in motion, and is consequently liable to be extensively and irregularly diffused. It is generally supposed that persons are not susceptible of its influence unless they are in almost immediate contact with the source of it. The liability of their being affected certainly increases with their approximation to the diseased body; it is, however, impossible to point out any limit, as exempting from, or subjecting to the operation of the effluvium, such exemption or subjection depending chiefly on the co-existing constitutional susceptibilities.

SECT. III.

The Influence of the Mind.

It seems scarcely necessary, after what I have already stated on this subject, to make any further observations upon it, but, as it has a particular reference to the disease we are now investigating, I shall offer a few additional remarks. The mind has both a direct and indirect influence on the animal functions, scarcely less extensive than the causes which have been enumerated. The ravages of cholera, when it has made destructive progress in one part of a country, are greatly magnified, and the report of them is widely spread, with all the horror which fear and ignorance can create, leading the imagination to conjure up a thousand frightful images. To increase the evil—the religious fears of mankind are excited by public fasts, the disease being represented as a sign of Divine displeasure. If, on the occurrence of such a calamity, the ministers of religion were as active in exciting cheerful

and exhilarating emotions, and in ameliorating the wretched and filthy condition of the poor, as they are in producing melancholy impressions, they would confer an incalculable good on society.*

* So little was the nature of the new pestilence yet understood; *and such was the extreme consternation produced by it, that the civil courts of the district were shut; and a stop put for a time to business of every description.* Although the general emigration which took place from the city, would seem to have had a decided beneficial effect on the state of its health, by diminishing that density of population, which has been since invariably found to be a powerful auxiliary to the epidemic; yet such was the energy of the disease in this, its first onset, and so fatally destructive was it of human life, that in this district alone it is reported to have, within the space of a few weeks, cut off more than six thousand of the inhabitants.—*Bengal Report.*

Cholera appeared at Tera, in Russia, in the autumn of 1829. It was suspended during the winter; but reviving in the spring, spread on the shores of the Caspian Sea and reached Astrachan. On the 8th of August, 1829, it appeared for the first time at Tiflis, and attacked three soldiers of the garrison. Doubts were entertained of the nature of the malady, but by the 13th those doubts ceased. *The affrighted multitude sought for a remedy against this new scourge in religious processions.—London Literary Gazette, No.* 736.—*February* 26, 1831.

It was here that the disease put forth all its strength, and assumed its most deadly and appalling form. It is uncertain whether it made its first approaches on the 6th, the 7th, or the 8th of the month. After creeping about, however, in its wonted insidious manner, for several days, among the lower classes of the camp followers; it, as it were, in an instant, gained fresh vigour, and at once burst forth with irresistible violence in every direction. Unsubjected to the

How wretched must be the feelings of the multitude who are warned of an approaching evil as if it originated in the vengeance of the Deity, and not in the operation of natural causes! It is well known to those who are acquainted with historical records, that soldiers, engaged in unsuccessful expeditions, are frequently attacked by contagious diseases, particularly if other concurring circumstances are favourable to their production. The disastrous retreat of Sir JOHN MOORE is a striking illustration of this fact. The army was

laws of contact and proximity of situation, which had been observed to mark and retard the course of other pestilences, it surpassed the plague in the width of its range, and outstripped the most fatal diseases hitherto known, in the destructive rapidity of its progress. Previously to the 14th, it had overspread every part of the camp, sparing neither sex nor age in the undistinguishing virulence of its attacks. The old and young, the European and Native, fighting men and camp followers were alike subject to its visits; and all equally sunk in a few hours under its most powerful grasp. From the 4th to the 20th, or 22d, the mortality had become so general, as to depress the stoutest spirits. The sick were already so numerous, and still pouring in so quickly from every quarter, that the medical men, although night and day at their posts, were no longer able to administer to their necessities. The whole camp then put on the appearance of an hospital. The noise and bustle almost inseparable from the intercourse of large bodies of people, had nearly subsided. Nothing was to be seen but individuals anxiously hurrying from one division of the camp to another to inquire after the fate of their dead or dying companions; and melancholy groups of natives bearing the

embarked with very great difficulty, broken down in spirits and destitute of the ordinary comforts of life, and in a short time its numbers were considerably thinned by disease. Victory, or the buoyant hope of success, has a tendency to dissipate or prevent the occurrence of sickness. The medical practitioner is fully aware that persons of a timid disposition are much more susceptible of infection than others of a bold and fearless character. Depressing emotions, when severe or long continued, usually give rise to disorganization of

biers of their departed relatives to the river. At length, even this consolation was denied to them; for the mortality latterly became so great that there was neither time nor hands to carry off the bodies: which were then thrown into the neighbouring ravines, or hastily committed to the earth, on the spots in which they had expired, and even round the walls of the officers' tents. All business had given way to solicitude for the suffering. Not a smile could be discerned, nor a sound heard except the groans of the dying, and the wailing over the dead. Throughout the night especially, a gloomy silence interrupted only by the well known dreadful sounds of poor wretches labouring under the distinguished symptoms of the disease, universally prevailed. The natives thinking that their only safety lay in flight, had now begun to desert in great numbers; and the highways and fields, for many miles round, were strewed with the bodies of those who had left the camp with the disease upon them, and speedily sunk under its exhausting effects. It was clear, that such a frightful state of things could not last long, and that, unless some immediate check were given to the disorder, it must soon depopulate the camp.—*Mr. Jameson—Bengal Report.*

the thoracic and abdominal viscera; and even when mild and of short duration, they produce in the human frame a degree of susceptibility which exposes it to the injurious action of external and internal impressions, which would have been unfelt, if the vital powers had been invigorated by exhilarating feelings or exercise, but in consequence of their debilitated state, produce epidemic and other diseases. Though I am rather disposed to confine the influence of the mind to the predisposition which it creates to such diseases, it is, however, in many instances, the occasion of cholera, dysentry, and fevers. If its power be acknowledged only as indirect, it is evident, that, in all cases, in which epidemics are general and of a fatal kind, low and desponding feelings will tend to render the propagation of them, from individual to individual, and from district to district, much more extensive than it otherwise would be. Without such a concurring circumstance, indeed, the vicissitudes of temperature, or the vitiated properties of the atmosphere, would often be insufficient to spread to any wide extent the ravages of Cholera.

CHAP. IV.

THE CONTAGIOUS NATURE OF CHOLERA.

THERE is scarcely a subject in medicine which has excited so much discussion, and occasioned such pertinacity of argument, as the one we propose in this chapter, briefly to examine, viz.: the contagious or non-contagious nature of Cholera. Both sides of the question have been violently espoused by individuals of equal respectability, talent, and practical investigation; the facts, however, which each adduces, and the reasoning by which they are supported, do not afford evidence sufficiently decisive to set this important question at rest. It appears to me, that much labour, and ingenious research, have been spent upon a matter which admits only of an approximation towards established truth. Had the contending parties attempted to ascertain *how far this subject is susceptible of direct evidence*, instead of hastily and eagerly seiz-

ing upon whatever seemed to strengthen their own particular views there would have been much less discrepancy of sentiment. It is asserted by one party that persons, who mingle most with those affected with this disease, are more generally attacked by it than others less intimately connected with them. This assertion is directly contradicted by the other, and the opinion of both parties is apparently supported by equal evidence, founded on a reference to numerous cases.*

* Convinced, as I am, of the total absence of contagion in this disease, I have observed the late revival in some measure of this opinion with some degree of pain. Surely if it was at all contagious, the fact of its being so could not long remain doubtful. In the general hospital here, there were three sepoys, who resided continually, from the first appearance of the epidemic, inhaling at every inspiration, by day and night, mouthfuls of infection. If the atmosphere was really loaded with contagious effluvia, arising from the bodies of the numerous inhabitants of the hospital, the escape of these men (which has been complete) would be miraculous indeed, living, as they were, in the very midst of these effluvia, and so near their source. Allowing that the constant habit of doing so procured them an exemption from the influence of this contagion, the same thing cannot be said of the friends and relations who were attending upon the patients, nor of six dooly bearers, changed daily, and who used to assist the sick into and out of the bath, and in every other way; thereby exposed to be infected with the disease, whether it is conveyed through the medium of the atmosphere or by touch; and yet I have not known one instance of dooly bearers, friends and attendants of the sick, being so infected; nor have any of our hallalchores, or hospital assistants, suffered. One of our corespondents supposes that the disease has

It is impossible to arrive at any satisfactory conclusion on this subject in any other way *than by an impartial and patient examination of the arguments adduced by each, of the exact manner in which the disease is communicated by contagion, and of those circumstances which predis-*

travelled in a direct route, at the easy rate of 15 miles a day, and *believes, if it could be proved*, that it has not shown itself in any village that had remained insulated, or unconnected with other villages where the disease was. Until this is proved, it is quite as easy to believe the contrary. In the meantime we have seen it affecting a particular part in one cantonment for days, without reaching another part, although a constant communication was kept up between these parts all the while.—*Mr. Whyte. Bombay Report.*

The opinion of the medical observer was, in all situations, founded upon his noticing the following facts:—In his attendance upon patients labouring under the disease, he did not find himself, or his assistants more liable to be attacked by it, than such persons as had no communication with the infected. He could not attribute his escape to the effect of precaution, for he took none; nor to the limited nature of his intercourse with his patients; for the disorder, and the remedies employed in it, were such that he was obliged to be constantly handling the body of the sufferer, and could not with safety leave his bedside during the height of the attack. It might even be said, that in every case the patient and he breathed upon one another, so that had the effluvium exhaled from the lungs or skin of the patient, been truly infectious, even in the slightest degree, he could have had no chance of escaping. Next he saw, that where one member of a family was ill, the others were not more liable to get the disease, than an equal number of individuals picked out from the general body of the community. This must be taken with some allowance. Sometimes two or more members of one family were seized: but in such cases, they were generally all taken ill together,

pose to, or preserve from, it. It will be at once acknowledged by all, who are not warmly interested in the controversy, that the opinions of those in favour of contagion, and of those opposed to it, are seemingly corroborated by facts of undoubted authority; and it is therefore,

were living in the same unwholesome situation, and had been previously exposed to some manifestly strong exciting cause: as the eating of noxious food, sudden vicissitudes of temperature, and the like. In the rare instances, in which one fell ill at some distance of time after another, if we do not chuse to consider the concurrence as purely accidental, we shall be at no difficulty to explain it upon remembering the depressing influence of fatigue, fear, sympathy, and grief—all powerful predisposing causes.

In camps, where the general body was more compact, and the sick more numerous, and crowded in smaller space, there was still ampler opportunity of confirming the truth of these observations. In no one instance were the dooly bearers, native compounders, or any other part of the large hospital establishments then necessarily kept up, although all were often so hard worked as to be scarcely able to stand from fatigue, more sickly than other descriptions of followers, nor did the soldiers, who constantly flocked to the hospitals, to see and watch over their sick comrades, appear by that means, to be more susceptible than others, of the disease. Nor were those patients, who were ill of other disorders, although always surrounded by persons in every stage of cholera, therefore more liable to be attacked; unless, perhaps, an exception be made in favour of convalescents: a class of persons always, from debility, much predisposed to fall into fresh disease.

In the centre division of the army all this was particularly remarked; and during the week the epidemic raged with so much fury, when the camp was a sick-ward, and every tent was filled or surrounded with the dead and dying, the officers suffered comparatively very little.

necessary to enquire how it is possible to harmonize facts of such an apparently discordant nature? It has been shewn in the preceding pages, that cholera is produced and propagated by the vicissitudes of the seasons, by vitiated respired air, morbid secretions, and depressing emotions, acting on the animal system, predisposed to this disease from the pecu-

From a number that could hardly have fallen short of three hundred, only five or six deaths occurred: and it should be remembered, that at this time officers of all descriptions were equally exposed with the medical men; for the sick had become so numerous, that even the services of all were insufficient to tend them with proper care, and duly administer the requisite remedies.—*Bengal Report.*

Dr. LABROUSSE traced step by step, and from house to house, the progress of the disease from the place of its debarkation into the town of Saint Denis; and shews that it took 17 days to clear a space of about 1000 feet. He states, in particular, that two negro patients having been carried to a place called the Chaudron, the disorder there entered two houses, and attacked in one six, and in the other two blacks; but that the other inhabitants of the place, terrified at what had happened, immediately insulated these individuals, and thus checked the farther progress of the epidemic in that quarter of the island. A black fisherman, he adds, having been seized at the house of a woman Mamedy, the negress with whom he resided took care of him during the short time he survived; and immediately afterwards, when the man's eyes were scarcely closed, she returned to her master's, a quarter of a league distant. There she was herself attacked next day, and subsequently communicated it to a black in the house, and a slave in the vicinity.

The same physician observes, that several prisoners of the jail, who were employed to carry patients and the bodies of the dead,

liar susceptibilities with which it is endowed. A knowledge of these will much diminish the perplexities and difficulties in which the subject is involved. When the disease, which is not always equally violent, is accompanied by its most formidable symptoms in situations extremely unhealthy, and amongst those who, from their mode of life, imperfect nourishment, or depression of spirits are parti-

perished in consequence of this occupation; that at the lazaretto two nurses alone escaped an attack; and that in the [general?] hospital some individuals who were attacked, imparted the disease to several servants and other patients. And he concludes with putting the question, by what miracle it could happen, if the disease were simply epidemic and not communicable from man to man, that the placing of a few men with arms in their hands, to prevent any one from crossing an arbitrary line, should be found sufficient to keep the disease from extending itself beyond it.—*Keraudren, Memoire sur le Cholera Morbus de l'Inde.*

During the stay of the disease in Orenburg, which was prolonged somewhat beyond two months, there were 299 patients in the military hospital; and they were attended by one army-surgeon, six pupils, six Baschkir lads, and fourteen servants, in all 27 persons. The surgeon and the pupils performed the operation of blood-letting as part of their duty, rubbed the hands and feet of the patients, applied poultices and leeches, and so forth; and the servants changed the bed-linen, put the patients in the bath, gave them their food, and the like. In the course of these occupations they were all compelled to come into close contact with the sick, to breathe the air around them, and to handle articles belonging to them. Yet not one of the whole 27 was ever attacked by the cholera.

During the whole prevalence of the epidemic in the city of Orenburg, there were returned, as residing in the hospital, several officers,

cularly predisposed to its influence, it may, perhaps, appear contagious: but when mild in its nature, and attacking persons not debilitated by hardships, fatigue, or mental despondency, especially if such persons reside in well ventilated places, it may be difficult to discover any well marked instance of its infectious character. This view of the subject, then, clearly explains the origin of the above-mentioned discrepancies, showing that the contagious power of the disease depends on its severity, the peculiar circumstances under which it breaks out, and the co-existing sus-

colour-serjeants, and inferior officers of the garrison, and likewise surgeons and pupils, till the other patients were removed to the camp. All these individuals were several times a day in the sick-wards, where they breathed the same air with those ill of cholera; and the surgeon and his pupils were also sometimes obliged to touch the patients. Yet not one of them was attacked by cholera.

The washerwomen of the hospital also escaped. One of them only who washed the linen of the officers was attacked: and this was before any officer had laboured under the disease.

I myself and Dr. Sokolov frequently went close to the patients affected with cholera in all its different stages, and without sustaining any harm.

It is true indeed that some of the hospital servants were seized, but this was without their having been near any people affected by the disorder. Some patients affected at the time with other diseases likewise suffered from an attack of cholera; but they had been kept quite apart from the patients labouring under that disease.—*Dr. Smirnov, Staff-Physician.*

ceptibilities of those within the sphere of its influence. The non-contagionists endeavour to invalidate the force of the arguments advanced by their opponents by stating, that the causes which first gave rise to the disease are in operation wherever it subsequently appears, and that to these, and not to immediate contact with the sick, or to any infection communicated by them, its propagation is to be referred: but the contagious, or non-contagious, influence of cholera depends on the nature of the circumstances under which it exists, and it is only by a reference to such circumstances that its two-fold character can be satisfactorily explained. This summary mode of deciding this question will satisfy neither party. It is, however, of little importance whether it does or not, provided it is strictly accordant with truth. The discussion of this intricate subject seems indeed to resolve itself into this simple consideration, *whether the foul air immediately surrounding the patient, and chiefly produced by respiration, and the morbid secretions of the body, be capable of generating the disease.* According to the principles previously stated in this Treatise, it appears that cholera may be occasioned by this cause, though it does not always, as before observed, give rise to this

disease even when it deranges the vital powers. In some instances it produces general disorder in the system; disturbance of the chylopoietic viscera, accompanied with considerable febrile excitement, being the predominating symptoms. Cases of this kind have fallen under my own observation, and they have always been readily cured by depletory or other measures. Of the numerous cases of cholera I had an opportunity of examining in Sheffield, and at Sunderland, only two appeared to me caused by contagion. The two to which I allude happened in the Cholera Hospital of the former town, soon after its establishment, and under circumstances certainly well calculated to produce the disease. At the commencement of this Institution there were only two or three nurses, the epidemic having as yet made little progress. Many cases, however, suddenly occurred, and were brought to the hospital, before it was possible to procure additional assistance, in consequence of which great bodily fatigue and mental anxiety were experienced, day and night, by the nurses, and they were both seized, whilst thus wearied and debilitated, with the malady, and both died. During the violent ravages of the epidemic, there were seldom less than thirty

or forty persons variously occupied in the hospital about the sick, or in direct connexion with the establishment, and I am not aware that more than two of these were attacked with cholera: several, indeed, complained of diarrhœa and slight derangement of the bowels; but, by the application of proper remedies, they were soon relieved. These slighter symptoms were most probably occasioned by constant attendance on the sick, and would, perhaps, if they had been neglected, have terminated in those which unequivocally characterise the disease. Daily and extensive observation of its ravages in Sheffield did not impress me with the idea that they were much aggravated by contagion alone. In those few instances, in which more than one of a family were attacked, it seemed fully evident that many causes were in operation, the conjoint influence of which was instrumental in the further extension of the epidemic. I have not seen a single case belonging either to the middle, or higher classes of society, which could be traced to occasional intercourse with cholera patients. These remarks are made, not with the intention of shewing that this disease is not contagious, but that it is so only to a slight degree. It appears to me, judging from what

I have seen, and from a patient examination of the facts adduced by both parties, that the influence of contagion has been greatly magnified. Most of the arguments advanced by its supporters might be invalidated by pointing out other causes besides contagion, the coexistence and action of which tend to propagate the malady—causes which have, in the first place, given rise to it, and which continue to extend its ravages by acting on constitutions endowed with peculiar susceptibilities.

CHAP. V.

Means which are calculated to prevent the Effects of Contagion.

THOUGH it is not possible, by any means whatever, completely to stop the progress of an infectious disease, it is in our power, by proper precautions, to lessen or circumscribe, in some degree, the violence of its ravages. The best preservatives against contagion, and the most influential in retarding the progress of pestilential distempers are—1st, a calm and cheerful state of mind : 2nd, nourishing and stimulating diet : 3rd, warm clothing and habits of temperance : 4th, guarded attention in waiting upon the sick. Of these, the first is, perhaps, the most important. If the mind becomes depressed, the qualities and distribution of the blood are quickly disordered, and the system is thus rendered much more susceptible of contagion. It is, therefore, of the highest importance, on the occurrence of a contagious disorder, that every possible means should be employed to preserve the mind tranquil and com-

posed, so that nothing can be more injudicious than for the heads of the church or the state, to appoint public fasts and prayers for the express purpose of averting the wrath of the Almighty, which the prevalence of the disease is represented as indicating; such representations being directly calculated to depress the spirits with gloomy apprehensions, and, consequently, to increase the evil which the religious observances are intended to arrest. Instead of fasting and praying in superstitious dread of Divine displeasure, the people should be encouraged to indulge in healthy and exhilarating amusements. Those in the fields and the open air are the best; but there are many sedentary amusements of a social kind which exert an enlivening influence on the mind, and may, therefore, be greatly beneficial. These, of course, are of various descriptions and character, from the humblest rustic games to the refined pleasures of the most cultivated society, and the highest intellectual enjoyment. Even the retired pursuits of the student or the author, when not leading to too close confinement of the body, may be serviceable in preserving health, as they produce a pleasing excitation of the mental powers, as well as an agreeable and tranquil state of feeling. In the uninformed

classes of society tranquil emotions may sometimes be produced by means which would excite only ridicule amongst the more enlightened; but even these means, such as carrying charms of supposed powerful influence about the person, or imploring the intercession of saints, or performing superstitious acts of severe penance, believed to be strongly influential in averting calamity, should not be discouraged, as absurd and ridiculous, whenever there is a possibility of their tranquillizing the feelings and soothing the mind. Whatever, indeed, has a tendency to do this is strongly to be recommended as a preservative from disease.

To those of enlarged and liberal understanding, it may be well to explain concisely the manner in which the epidemic is generally produced; and to state the conditions of the system which facilitate its attack and aggravate its violence, as well as the different causes which invigorate the powers of life, and consequently render the frame less liable to be attacked by any infectious disorder. No pains or ingenuity should be spared to diffuse, in every possible way exhilarating feelings through all ranks of society; since we may rest assured that, in proportion as this object is attained, the propaga-

tion of cholera will be circumscribed, and the severity of its symptoms ameliorated. It has often been truly remarked that those who entertain no fear during the prevalence of contagious diseases are much less liable to be attacked than others of a timorous disposition : and this undoubted fact shews the absolute necessity of preserving the public mind in a tranquil state, in order to arrest or lessen the spread of such diseases.

I am fully aware that the importance which I attach to mental influence, will appear to some much overrated, but my opinion is perhaps entitled to some credit, having not only paid particular attention to this subject, but explained the manner in which depressing emotions derange the properties and circulation of the blood. If a person, whose disposition is naturally timid, and whose feelings are depressed, has been exposed to the influence of contagion, and is subsequently indisposed from the inhalation of a small quantity of deleterious air, he is apt to be fully impressed with the idea that he has caught the prevailing disease, and, therefore, instead of arousing himself to vigorous action, or employing timely measures against the disorder, he broods over his un-

happy situation, dejected in spirits, and indifferent to every kind of exertion, until at last he sinks beneath the evil which he had tremblingly apprehended: whilst an individual of a bolder character and more sanguine temperament, if he feel slightly unwell, after fearlessly visiting the sick, retains his usual flow of spirits, and is quickly restored to health. It must not be imagined that the contagious matter, when communicated, will necessarily produce the disease in its severer forms: the progress of the disorder having, in numberless instances, been prevented or restrained by proper and timely aid. Nourishing and stimulating diet invigorate the vital powers, and thus enable them to resist the influence of causes that would otherwise depress them. Contagious diseases are generally most severe and frequent among those whose natural constitution is weak, or debilitated by fatigue, want, or mental anxiety. There is little to fear from exposure to contagion when the animal and organic functions are vigorously performed.

Intemperance of every kind should be scrupulously avoided, since it enfeebles the body and produces great disorder in the nervous

system, the common indications of which are excessive languor, or irritability. Warm clothing, with as little exposure as possible to the night air, is calculated to preserve the natural tone of the system, and must therefore be attended to, as well as a free circulation of fresh air in the chambers of the sick.

It is generally admitted, and my own observations corroborate the opinion, that this epidemic is preceded, in the greater number of instances, by diarrhœa or derangement of the bowels, by correcting which, the appalling forms of the malady are generally prevented. During the prevalence of cholera this particular symptom was extremely common among the middle and higher classes of society; being, however, generally removed in a few days, and terminating in two or three cases only, to the best of my knowledge, in this formidable disease.

CHAP. VI.

THE TREATMENT OF CHOLERA.

SECT. I.

The Indications of Treatment.

HAVING traced the origin and progress of this malady, we are now prepared to examine the various remedies which have been proposed for its cure. It must be manifest to every one, at all acquainted with this subject, that we possess nothing like clear and settled notions concerning its treatment. Very different measures are strongly advocated by different practioners, and equally extolled for their efficacy. Amidst so much discrepancy of opinion and diversity of treatment, the physiologist is perplexed, and, perceiving no fixed principles on which he can securely rely, he is compelled to investigate the operation of the various

remedies recommended, in order to determine the degree and character of their action, and finally to lay down such principles as may regulate their selection and prescribe their use. It is scarcely necessary to say that a correct knowledge of pathology is indispensable to suggest a proper line of practice.

Experience in medicine, unless enlightened and regulated by just views of disease, is liable to lead into error, by instituting rules for general adoption and application, without pointing out, at the same time, the particular circumstances under which they may be advantageously adhered to. The experience of one may, perhaps, apparently prove that calomel alone is a specific for cholera; that of another may be exclusively in favour of venesection; that of a third of emetics; but, whilst each zealously contends for his own favourite remedy, they are all equally deficient in satisfactorily explaining two particulars of the utmost importance; viz., *the pathological principles which have suggested these different remedies, and the manner in which they operate.*

If we had been furnished with information of this kind, there would have been little dif-

ficulty in deciding on the relative value of the various remedies recommended, because we should have been in possession of the particular facts on which they were founded, and consequently enabled easily to ascertain how far these facts were understood, and with what degree of accuracy they were acted upon. To afford this information is the object of these physiological investigations. Should I fail, however, in doing this, the attempt may perhaps, assist others in endeavouring to arrive at important truth : at all events, I can scarcely be so unfortunate as to lead into error, *since the direct aim and tendency of these investigations are to make known the natural and morbid actions of the animal system, on a knowledge of which just principles of practice can alone be based.*

Nothing has certainly tended more to retard the establishment of such principles than our ignorance of the nature and seat of disease : for, although the same class of affections may be cured by very opposite remedies, it is not to be supposed that they are all equally efficacious, or require the same caution in using them. Some must be allowed to be more energetic and safe in their operation than others, requiring less favourable circumstances

to secure their good effects. From these investigations it will appear, that the same modifications in the important functions of the animal economy, are produced in cases of disease by means which are very dissimilar in their mode of action: some being direct, others indirect; some partial, and others general in their operation: hence, before a selection is made, these differences ought to be carefully considered, so as to combine in our choice the greatest possible utility with perfect safety. To an imperfect acquaintance with these matters, or too slight a consideration of them, the multifarious measures employed in the treatment of the same diseases, are chiefly to be referred. The success which has attended the application of any of them may often be traced to obvious and striking differences in the severity of diseases, and not unfrequently to constitutional susceptibilities. To correct the practical errors arising from erroneous views on this subject, and to substitute in the place of uncertain and varying, fixed and settled principles of a philosophical kind, can be accomplished only *by an intimate and accurate acquaintance with the nature of the morbid deviations, and the precise action of the remedies employed.* In proportion as this knowledge is

attained, the uncertainty and complexity which at present characterise the practice of medicine will be gradually removed, and be succeeded by measures at once simple and efficient. Cholera, however widely it may vary in the violence of its symptoms, or the causes of its production, may be considered a *congestive* disease. The inflammation, fever and disorganization which frequently accompany it are its effects. The congestion is occasionally so extensive and instantaneous as almost immediately to destroy the powers of life, and even when more limited and less sudden, it deranges almost every organ of the animal economy, and lays the foundation of structural changes. Having, in the preceding pages, given a minute description of the symptoms of this malady, a recapitulation of only the most prominent and prevailing is necessary here. The abdominal viscera are generally greatly engorged. The liver and the spleen in particular are sometimes excessively enlarged, and the stomach and intestines are very much disordered, as is manifest from the morbid secretions which are evacuated. The lungs are also generally congested. The heart contracts with difficulty, its energy being diminished, and the whole of the sanguiferous

system is strikingly disturbed. The functions of the brain are frequently implicated in the general disease. The generation of animal heat is lessened. The extremities are cold, and the blood is deteriorated in its properties. A few organs only may, perhaps, appear affected amidst this extensive derangement, leading the medical attendant to suppose, that these alone are diseased when, in fact, every part of the animal frame participates, more or less, in the existing disorder. The treatment indicated by these symptoms is, then, simple and evident, viz.: *to re-establish the balance of the circulation.* The facility with which this is accomplished will depend upon the degree of the morbid deviation, the length of its duration and the natural energies of the animal system; circumstances which will, also influence the selection and application of remedies. Instead of being regarded as primarily characterised by congestion, and, therefore, demanding prompt and general measures, this affection has too often been considered as arising altogether from the secretion of vitiated bile, the disease of some particular nerve, or nervous apparatus, or the disturbed action of some important organ; and the treatment adopted has consequently

seldom been sufficiently active and general to effect all that is possible towards arresting the progress of the malady, or meliorating the structural modifications which are liable to occur.

To restore the balance of the circulation is undoubtedly the most proper treatment, as it removes the formidable symptoms of the disease: it may, however, be objected to this treatment that there are other symptoms, some preceding the most formidable, some succeeding them, particularly in the consecutive febrile stage, which is of frequent occurrence, such as diarrhœa, flatulence, pain in the bowels, occasional sickness, and slight spasms, which require remedial measures of a somewhat different kind from those particularly calculated to re-establish the natural powers of the sanguiferous system; and the same objection will apply, with equal force to local inflammations, partial congestion, febrile excitement, and various other derangements generally prevailing in the consecutive stage of the malady. It would not, however, be difficult to prove, that the efficacy of any remedies employed to correct the less important symptoms, would be proportionate to their influence

in restoring the healthy functions of the circulatory system. Several modifications of treatment will be pointed out in the succeeding chapter, accommodated to the existing differences in the character of the disease; and the action of various remedies, which do not operate directly by improving the circulation, will, therefore, be necessarily examined. In the discussion, respecting the operation of these remedies, principles are developed which have not only a reference to cholera, but to many other affections, and if it be not shewn in this Treatise how they particularly apply to them, it is because such application cannot be properly understood till those affections have been separately considered.

SECT. II.

An Inquiry into the action of Venesection, and a consideration of its efficacy in the Treatment of Cholera.

In order to shew in what way the sanguiferous system is acted upon by the abstraction of blood, it will be necessary to explain generally how the principal functions of the animal economy are influenced by the same cause. Venesection may be considered both a stimulant and a sedative: its stimulating influence is displayed when the system is oppressed by congestion; its sedative, when it is more than usually excited. It has been shewn, in the foregoing pages, that whenever the circulation or the respiration is accelerated, the blood is necessarily more highly oxygenated, because the whole mass passes in a given time more frequently through the lungs. An improvement in the properties of the blood increases the action of the heart and that of the vascular system generally. Internal and external sedatives allay

any inordinate action, in consequence of the deterioration they produce in the vital fluid; *the former, by enfeebling the contractions of the heart and capillaries; the latter, by determining an undue proportion of blood to the lungs.* It is, also, possible to weaken the circulation by a diminution of its mass, which almost immediately depresses the action of the heart, and consequently renders the transmission of the whole mass through the lungs less frequent in a given time. Venesection would fail in producing decided sedative effects, if the blood after the operation continued to experience the same degree of chemical changes. It occasionally happens, even when the circulatory system is somewhat excited, that the abstraction of blood increases its activity. This phenomenon arises most probably from a certain extent of congestion co-existing with the vigorous motion of the vital fluid, the diminution of which affords an additional proportion of blood to that already in circulation, or from the removal of certain impediments to the free transmission or chemical modifications of this fluid in the respiratory organs. Previous to the development of the principles in the "Experimental Inquiry," respecting the generation of animal heat, it was impossible to give any

rational or satisfactory explanation of the manner in which venesection influences the qualities and motion of the blood, because the important changes in them originate *in alterations in the quantity of the fluid submitted at any one moment to the action of the inspired air*—a fact which had entirely escaped the consideration of physiologists. Venesection will always reduce an excited action of the circulatory system, and generally relieve, also, internal congestion, especially if of short duration. The employment of it, however, in the latter instance, requires great care and judgment, or the vital powers, already much oppressed, may be suddenly and irrecoverably arrested.

1. When the accumulation of blood in the internal organs is recent, bleeding may be employed with greater probability of success than when it has continued for any length of time.

2. It may be used with safety on almost all occasions when the congestion is great, providing the animal system exhibits a slight degree of activity.

3. It must be employed with considerable caution, if at all, when the pulse is scarcely

felt at the wrist and the energies of life are exceedingly depressed.

When the thoracic or abdominal organs have suffered for several days, or a longer period from engorgement, it necessarily follows that their structure is more deeply implicated in the existing mischief than if they had been so circumstanced for a shorter time: the engorgement, in this case, producing in them the first stage which precedes manifest disorganization—a stage admitting of great diversity, viz., *a partial stagnation of blood,* It cannot be doubted that these organs are enlarged and have become denser in substance, in consequence of having received an undue proportion of the circulating fluid, a great part of which will probably remain stationary until removed by the powerful efforts of nature, or the continued application of remedial measures. Though it may be difficult to adduce exact and positive evidence to prove, that congestion of the capillaries and the consequent derangement of their functions, cannot exist long without causing important structural modifications in them, there is great reason for believing that such modifications are produced. The simple and indisputable fact, that the

internal organs have been congested for a longer or shorter period is, however, alone sufficient to support the principles I am attempting to establish. When a quantity of blood, greater than is natural, has existed for several days in any part of the system, it will be more difficult to remove it, or to put it in motion by local or general means, than if it had been so situated only for a few hours, *because the circulation in the capillaries will have deviated more widely from its ordinary conditions.* Venesection, then, under these circumstances, should be used with great caution, *or a portion of the vital fluid, already in motion, will be abstracted, without communicating a sufficient stimulus to the congested vessels, to enable them to throw into the general circulatory system the superabundance of blood which oppresses them, so as to cause an invigorated action.* If this effect is not produced, venesection will be highly detrimental, as it will enfeeble still more the powers of life, and thus, perhaps, prevent the possibility of a recovery. I have lately witnessed several cases of improper treatment in diseases characterised by internal congestion, in which bleeding was employed under circumstances that did not warrant a recourse to it. The blood cannot be

husbanded with too much care when unequivocal symptoms of inflammation do not exist: in such cases the first object ought to be to regulate the distribution of the blood by general and local stimulants, after the application of which, should the system be over-excited, or, considerable congestion still remain, venesection may be productive of excellent effects.

Fromthese observations it is evident, that the length of time during which any of the viscera have suffered from engorgement, must ever be kept in view when the propriety of bleeding is a subject of consideration: for, if the congestion has continued long, the difficulty of relieving the surcharged vessels will, probably, suggest some other remedy, or, should bleeding be thought at all advisable, shew that it ought to be local rather than general, or, even in case the latter be deemed necessary, that the quantity of blood abstracted at any one time should be small.

The same circumspection is required when the congestion is very great, although it may not have existed long. The difficulty of recovering drowned persons is, of course, greater, the longer the powers of life have been sus-

pended, chiefly in consequence of the motion of the blood being extremely enfeebled, or altogether stopped. *In this case it is no easy matter, by acting on any part of the sanguiferous system by means of friction or stimulants, to produce so strong an influence on the whole mass as to excite animation.* Failure in effecting this does not arise from the impossibility of awakening any mysterious vital principle, but simply from being unable to restore the circulation. The greater the degree of congestion, whether local or general, the more stagnant will be the blood. The conditions of the sanguiferous system in congestive disease, and those which characterise it after drowning, are much alike in some important respects. The reasoning employed in respect to the latter, to shew the difficulty of reviving the almost extinct powers of life, will apply as strongly to the former, limited of course, in some degree, by the natural difference existing between them. The small quantity of blood in actual motion in cases of extreme congestion, and the feebleness with which it is circulated, is not likely to be invigorated by trifling additions derived from the surcharged organs, consequent on venesection, because the blood they possess is not, at

this time, endowed with highly stimulating properties. It has frequently happened, when venesection has been employed under such circumstances, that death has quickly followed, and for a very evident reason, — *the blood withdrawn was not succeeded by an excited action of the congested vessels, and the loss of what was removed, consequently rendered the remaining portion in circulation inadequate to perform the various functions of organic and animal life.*

Bleeding has been occasionally found highly serviceable in the treatment of cholera, but the success which has attended its application does not authorize its general or unqualified adoption. Its utility has appeared most decided in the spasmodic forms of the disease. When the vital powers are suddenly and inordinately enfeebled by the internal accumulation of blood, unaccompanied by muscular contractions, it can scarcely be used with safety, unless conjoined with other means calculated to rouse the system. It is not an easy matter completely to re-establish the functions of the circulatory apparatus, since, long after the pulse has regained its usual strength, and the generation

of animal heat is regularly performed, the minute capillaries throughout the body, but particularly those which have been deeply implicated in the disorder, remain for a considerable time in a debilitated condition, destitute of sufficient energy to enable them to recover their natural powers. This fact is important, as it suggests the propriety of watching the progress of improvement through the whole stage of convalescence.*

It has not been satisfactorily shewn why venesection is more peculiarly adapted to the spasmodic form of the disease than to the simply congestive : this, therefore, I shall now attempt to explain. When the affection is characterised by extraordinary depression of the vital powers, unaccompanied with violent spasms, the circulation necessarily remains extremely weak, and consequently the propriety of abstracting blood, at this time, is often very questionable, but when the body is strongly contorted and agitated, the motion of the blood is partially excited by the spasms, which accounts for the frequently successful operation of venesection during their continuance. The spasms are not, indeed, alone

* See Note B.

sufficiently great to overcome the congestion which produces them, but the tendency of their action is clearly to accelerate the circulation. Mr. SHEPHERD, during a short stay in the Brazils, found bleeding alone a certain cure in the severest cases of this disease. The general character of those cases, however, being evidently spasmodic, the benefit that was derived from this remedy is satisfactorily explained on the principle just stated.

"In more than forty cases," he observes, "which came under my care during the four months we were in the harbour of Rio Janeiro and on the coast, I found bleeding to *syncope* instantly and uniformly successful alone. There was no critical biliary discharge, but the disease was removed before the arm was secured, and no subsequent medicine was required. The intestinal spasm was far more violent than I had ever witnessed in the West Indies, and bore a strong resemblance to the convulsive paroxysm, so much so that I was generally called to patients said to be in *fits*; and the powers of several men were required to restrain them."

The experience of Mr. ANNESLEY, and

Mr. BURREL, does not allow them to speak in such favourable or unqualified terms of the efficacy of bleeding. It is the opinion of the former that "if it can be accomplished in the early stage of the disease, and before the *circulation at the wrist has ceased,* in nine cases out of ten it will prove successful, especially if the colour of the blood change from black to red, if the pulse get up and the spasms be relieved:"* and in this opinion the latter concurs, considering it useful if had recourse to early in the disease, while the vital powers are strong, so as to produce a full stream of blood. Its accelerated flow, and particularly if florid, is unequivocal evidence that the internal organs are greatly relieved. The change of colour proves, that the lungs are so far disburdened as to allow the inspired air to act with considerable effect on the blood—a symptom of the highest importance, as it gives just hopes that the circulatory system will speedily recover its usual energies. These general remarks on venesection will enable us to appreciate those causes which ought to regulate its employment, and which, indeed, explain the discrepancies of opinion concerning its efficacy. This remedy, which has been

* Influence of Tropical Climates, p. 299.

justly extolled in the treatment of the prevailing epidemic in tropical climates, has not been found equally successful in this country nor on the continent of Europe. In these more northern climes, diarrhœa, or disordered condition of the bowels, has more frequently been observed to precede this disease, than in hot and sultry regions. This is a very important difference as connected with the subject under discussion. In those cases in which diarrhœa precedes, the energies of life are gradually and often greatly reduced, so that when the urgent symptoms of depression occur, the abstraction of blood is not only extremely difficult, but if effected, is not likely to be beneficial, because it will fail to rouse the sanguiferous system to increased action; but when these symptoms suddenly take place, from great severity in the exciting causes, this remedy occasionally exercises the most salutary influence, the vital fluid being previously possessed of its usual conditions.

From the numerous accounts transmitted to this country, by medical officers in the service of the East India Company, it appears that when venesection was decidedly efficacious, it was under such circumstances as have

been just specified, and it should also be observed, that the results of its employment are chiefly derived from cases which occurred in the army, in which the vigour of the human constitution was generally greater than among the more wretched of the natives, that were peculiarly susceptible of the ravages of the epidemic. Some of these accounts state, that the patients occasionally recovered almost immediately on the abstraction of blood, their restoration to health being indeed as sudden as the attack of the disease. This phenomenon was not observed in this country, and for the reasons which have been assigned. Those instances which came under my own observation, in which the employment of this remedy was decidedly beneficial, were invariably amongst persons whose constitutions were naturally strong, or whose vital energies had been but slightly debilitated by previous derangement of the bowels.

The cases were, however, very few which admitted of venesection, or were benefited by it. It appears to me, that this remedy is of questionable utility in any stage of the disease occurring amongst the most destitute of the lower classes of society. There is no great

cause for using it on the first symptoms of collapse, as they are generally the effects of constitutional debility, and are not, therefore, likely to be arrested by what necessarily produces a further increase of that debility; and the employment of it when these symptoms are fully established, will mostly fail in even partially rousing the circulatory powers, and must consequently be injurious. The only cases, as already remarked, in which the abstraction of blood is of great utility, are such as occur in somewhat vigorous constitutions, or which have not been greatly exhausted by diarrhœa or any other depressing cause. In many cases of this kind, the measure may be adopted without any hesitation at the commencent of the malady, and even in the early stage of collapse, because the animal system is endowed with considerable energy. It has been stated by some writers, that if venesection were used after the patient had been immersed in the warm bath, it would then exert a beneficial influence. It might, perhaps, be succeeded in some instances by an invigorated circulation, thereby tending to correct the congestion of the internal organs, but it should ever be recollected, whatever be the preparatory measures applied to excite

the circulatory powers, that the existing depression is mainly attributable to a debilitated state of the body induced by various causes, and the abstraction of the vital fluid ought, therefore, to be used with the greatest possible circumspection.

SECT. III.

An inquiry into the action of Emetics, and a consideration of their efficacy in the treatment of Cholera.

Our limited acquaintance with the changes effected in the properties of the blood, on the employment of measures which disturb the regular action of the respiratory organs, cannot be more clearly shewn than by an examination of the very different opinions entertained of the operation of emetics. At one time they have been considered specifics in the cure of fevers, especially if given in an early stage; at another time they have been disregarded as altogether inefficient, or at least of doubtful value. By one they have been held in high estimation in the treatment of consumption, by another in that of hemoptysis, and their employment in both these diseases has been frequently shewn to be very injurious. Such discrepancies of opinion originate in two causes: *an imperfect acquaintance with the na-*

ture and seat of the diseases in which the remedies were applied, and an ignorance of the changes which they produce in the properties and circulation of the blood.

Emetics are frequently prescribed for the purpose of evacuating the contents of the stomach, as if their beneficial tendency were restricted to such operation: the changes which they cause in the qualities and distribution of the blood are scarcely ever taken into consideration; when, in fact, the greater part of the improvement consequent on their employment is attributable to these changes. The discovery of the principles which regulate the generation of animal heat, and the oxygenation of the blood, distinctly shews, that such modifications are the results of their action, and the cause of the great benefit which they occasionally confer, except in those cases in which the stomach alone is very much disordered by the nature or quantity of its contents, the removal of which immediately occasions the restoration of health. It has been stated, that exhilarating emotions, lively conversation, exercise of every kind, external and internal stimulants, *equalize the distribution of the blood, and thus diminish the quantity exposed at any*

one moment to the action of the inspired air—a condition which has been shewn to augment the chemical changes in the lungs.

These important facts having been ascertained, it is obvious that the action of vomiting exercises the same kind of influence over the whole of the animal economy. The frequent retching and violent action of the stomach, conjoined with the severe muscular play of the thoracic and abdominal muscles, are, indeed, strikingly calculated to effect similar changes.

The immediate effects of vomiting are :—

1. An evacuation of the contents of the stomach.
2. An equable distribution of the blood.
3. An improvement in the properties of the blood.

The operation of emetics being thus understood, little difficulty can be experienced in appreciating the conditions of the system in which their influence is likely to be beneficial. They may be very safely recommended—

1. In all cases of simple congestion, whether partial or general.

2. In all cases in which it is advisable to evacuate the contents of the stomach.

3. At the commencement of all fevers, providing there is no decidedly local inflammation, as these fevers always arise from, or are connected with, internal congestion.

4. In a generally disordered state of the body, as indicated by the small and frequent pulse and derangement of the chylopoietic viscera,—a state of disease common in persons of sedentary habits.

After the remarks which have been repeatedly made on the necessity of properly oxygenated blood to support the well being of the animal economy, and the manner in which it improves the whole system, it would be a waste of time to attempt to shew, by any lengthened observations, how the operation of vomiting removes the above mentioned diseases. It cannot fail to be of advantage in congestion of the thoracic and abdominal organs, whether it be recent or of long continuance. I have found it of invaluable service, especially in chronic congestions occurring in females when the uterine functions are greatly disordered, accompanied with difficulty of breathing on the slightest exertion; pain in the chest, constant

or felt only on deep inspiration; acute sensibility over the whole of the abdominal viscera, evident on the least possible pressure; a pulse extremely small and frequent; extremities always cold, and general derangement of the animal and organic functions. The first indications of improvement are a clear complexion and less pain on full inspiration, which, after the exhibition of several emetics, at the interval of two or three days, are quickly succeeded by other indications of a more decisive character: the pulse having acquired strength and the extremities heat, the body being, at the same time, altogether less sensible of cold, the difficulty of breathing and the acute pain felt on pressure over the abdomen having been ameliorated, and a corresponding improvement having taken place in all the functions of the chylopoietic viscera, as well as in the desponding feelings of the mind. It is, however, sometimes a very difficult task, even by a combination of the most efficient measures, entirely to re-establish, in cases of long continued congestion, the natural energies of the vital powers, nor will this appear extraordinary when we consider that the capillaries of the organs, chiefly diseased, have, from their long engorgement,

lost their usual tone and action, and can, therefore, in their enfeebled state only very slowly recover their functions, if they can recover them at all.

The different substances employed to promote vomiting vary in the instantaneousness and violence with which they operate, and the extent of nausea they produce, so that though the influence they exert on the system is of the same kind, it is by no means exerted in the same degree. One, from its severe and long continued action, effects extensive changes in the distribution and properties of the blood, relieves the surcharged organs, stimulates the secretory functions and excites copious perspiration. Another, from the facility with which it evacuates the contents of the stomach, and the slight degree of retching and vomiting which accompanies its operation, is decidedly less efficacious when it is desirable to produce a powerful influence on the sanguiferous system. It must not be forgotten that the beneficial agency of these means does not generally consist in the removal of any thing from the stomach, but in the violent or frequent contractions of this organ, and of those muscles associated with it in the act

of vomiting. The long continued, or often repeated action of emetics is supposed by many practitioners to debilitate the system, by wasting the nervous energy. Were the nature of those diseases which require such remedies correctly understood, we should hear nothing of the destruction of nervous energy or of any particular vital principle. It would be absurd to prescribe them in the last stage of consumption, when the constitution is manifestly broken down, or on any occasion when direct debility forms the chief or only symptom. Under such circumstances the strong and torturing action of emetics would certainly be injurious: it could not possibly lead to any improvement, because it would not produce the effect it never fails to do in cases of simple congestion, viz.,— *to throw into vigorous and healthy circulation an additional quantity of blood endowed with stimulating and nourishing qualities.*

The fear of enfeebling the body is groundless, when the employment of emetics is properly regulated, because the debility which may exist has not arisen from decay of the powers of life, as in old age or consumption, *but from general derangement of the chylopoietic viscera, arising from the irregular dis-*

tribution of imperfectly oxygenated blood. The truth of these remarks is fully illustrated by the morbid effects succeeding depressing emotions and the sudden cessation of the catemenia: the internal organs, in such cases, being much congested, great languor and debility are produced, which, however, are removed in proportion as the balance of the circulation is re-established. The diminution of the congestion invigorates the system, *by throwing into circulation a quantity of blood, previously confined to the diseased organs, which soon acquires new stimulating properties in the lungs, and becomes more nourishing from its admixture with abundant and greatly improved chyle.* Hence it is absurd to suppose, that emetics debilitate the animal system when given under circumstances in which their operation is evidently requisite, and it will appear from the foregoing remarks, that their action is calculated to be of essential benefit in the treatment of cholera, *this being mostly characterised by great internal congestion.* That they have not been more generally used, is strong presumptive evidence, that both the pathology of this affection, and the operation of this remedy have been imperfectly understood. Mr. BOYLE has, however, given them, and with re-

markable success, in the epidemic cholera of the East Indies. He was led to this line of practice not from any just notions of the nature of the disease, or the action of vomiting, but from supposing that the obstruction of the biliary ducts, as a continued source of irritation to the nervous system, was the principal cause of the disease: he therefore employed emetics to promote the flow of bile.*

There is no just ground to apprehend that the vital powers, in cases of cholera, will be suddenly arrested by the action of emetics, or be so depressed by the muscular efforts excited as to render it difficult to revive them. The sickness and vomiting will necessarily cause slight debility, but this will continue only for a short time. As the good effects produced

* "The constant nausea and irritation of stomach which is observable in the early stages of this complaint without full or violent vomiting, simply spouting up, as it were, any thing swallowed; the obstruction of the biliary ducts observed on dissection, and a general want of success in practice, induced me to embrace ideas perfectly new on the subject. The obstruction of the biliary ducts, I looked on as a source of irritation to the nervous system generally, and the nausea and sickness of stomach, as an effort of nature to free herself of an unaccustomed evil. In accounting for the causes of this disease, it has been observed, and with great justice, that when, from the exertions to vomit, bile makes its appearance, a favourable prognosis may be formed. Now, if the appearance of bile be a salutary

depend altogether on the extent of the alterations in the properties and distribution of the blood, succeeding the violent and repeated agitation of the stomach and the muscles associated with it, in its antiperistaltic action, it is absolutely requisite to excite free and full vomiting in place of nausea alone, especially as the latter exerts a decidedly depressing influence. Venesection, the warm bath, counter-irritants and internal stimulants, are remedies too well known, and justly appreciated, not to be employed in combination with emetics. These latter remedies were frequently used in this country, and on the continent of Europe, in the treatment of the prevailing epidemic, and occasionally with striking success, but this success was by no means sufficiently general to entitle them to the name of specifics. I have rarely

one, and it certainly is, why not favour the progress of its formation instead of obstructing its passage by the administration of sedatives? We know of nothing that will increase the secretion of bile so quickly or so effectually as the act of vomiting. We also know the sympathy which subsists between the liver and stomach, and that derangement of other organs will more or less affect both. It is evident, then, that the gastric derangement peculiar to this disease, is not only indicative of the existence of lurking mischief, but directly points to the treatment. Further, of all the cases of which I have seen or heard, there was not one fatal termination, after bile had, in any way or by any means made its appearance."—*Influence of Tropical Climates, p.* 303.

seen them of any use in the last stage of collapse, and, if ever employed in this stage, it ought to be in conjunction with other means, such as friction with stimulating embrocations over the greater part of the body, and occasonally the abstraction of blood from the arm. The former is an indispensible accompaniment, and the latter may often be employed at the same moment with considerable advantage. It has too often happened, that emetics have been given, by persons not fully acquainted with the mode of their operation, or the particular effects which it was necessary to produce to constitute their beneficial influence; hence, they have been at one time zealously employed, and at another utterly neglected, without any just conception being formed of their real value. They are not given, in this disease, for the purpose of removing from the stomach any thing of a detrimental nature, for nothing of this kind can exist in it after the repeated evacuation of its contents, which takes place independently of any means to excite it, and their utility must consequently arise from the changes which they occasion in the distribution and qualities of the blood. Every possible exertion should therefore be made, when they are prescribed, to pro-

mote full and frequent vomiting. If this be produced, the vital powers will almost certainly be roused, and the symptoms of de pression overcome; but if it does not take place, emetics will be of no decided use. The inefficiency of them in the latter stage of the malady is attributable to the diminished sensibility of the animal system. They fail to cause, as in health, frequent vomiting. Occasionally the patient feels only slight nausea, and very often vomits but once. Hence it is not at all extraordinary that this disease has not been more generally controlled by emetics, though there is no single remedy so well calculated to exercise the same degree of beneficial influence in the early symptoms, and even afterwards, so long as it is possible to excite repeated vomiting. I have employed them on numerous occasions with great success. The cold extremities and clammy state of the skin have sometimes been entirely removed by means of them in the course of a few hours; the pulse has acquired strength and fulness, and the distressing symptoms of diarrhœa, nausea and vomiting have generally subsided. As the object in giving emetics is to produce vomiting, or to rouse the circulation, it is clear that they should be

of a stimulating description. Those which are generally prescribed in common diseases will be improper in this. Mustard is unquestionably the best that can be selected: it will occasionally excite vomiting when the others would only nauseate, and it has, moreover, a natural tendency, from its irritating nature, to give new tone and vigour to the capillaries of the stomach and bowels, with which it is necessarily brought in contact. The modifications which it causes in these respects, by its direct application, are highly important, and may, independently of the muscular action occasioned by vomiting, contribute much towards recovery.

The peculiar manner in which mustard operates, may shew the propriety of prescribing it, when it has rarely, if ever, been used in other diseases, in the cure of which the primary consideration and the great difficulty, is to rouse the sanguiferous system. Salt and warm water is another excellent emetic, which has generally been employed in conjunction with mustard to render the action of it more certain or energetic.

Those who imagine cholera to depend on, or to be connected with, some inflammatory

process in the stomach and bowels, object to the employment of emetics as calculated to aggravate the disease: but there are no just grounds for supposing they will do this. If they are ever injurious, it is not by giving rise to inflammation but by debilitating the exhausted powers of life at a time when, from the previously enfeebled state of those powers, they must fail to produce full and frequent vomiting, and ought not, therefore, to be recommended.

SECT. IV.

An inquiry into the action of Internal Stimulants, and a consideration of their efficacy in the treatment of Cholera.

THE occasional utility of internal stimulants in the treatment of this disease has been practically proved. The good effects which they produce do not, however, appear to depend on any particular properties which they severally possess different from those belonging to stimulants in general, all of them being capable of producing, with greater or less facility, the same effects, though scarcely any two of them influence the animal economy in precisely the same manner. One causes great and immediate excitation without disturbing, to any appreciable extent, the mental faculties. Another is more gentle and gradual in its operation, scarcely affecting at all the powers of the mind. When taken in excess, the phenomena exhibited by them are also very dissimilar. The brain in one instance loses its natural

sensibility ; in another the stomach, or some other organ, is chiefly deranged. The effects are indeed so different, that a minute investigation of their varieties, and the causes of them, would be highly interesting and important, apart from the general consideration of this subject. The investigation on which we propose entering is less enveloped in mystery, and has likewise very striking relations to the daily practice of the profession ; but independent of these considerations, it is necessary that we should become fully acquainted with some individual property, easy to ascertain, which is common to all stimulants, before an examination is instituted into others less universal and much more difficult to discover, this being the best and surest method of ascending to general principles.

If the internal organs be supposed to be congested, it is important to ascertain how they are influenced by a stimulant conveyed into the stomach. *It may act on the internal surface of this organ by actual contact; or by absorption, affecting every part of the animal economy, but particularly the circulatory apparatus.* The inquiry, then, appears to be confined to these two considerations. If a stimulus be

applied to the external surface of the body the capillaries are soon excited to increased action, as indicated by the redness of the affected part, and the occasional sensation of throbbing. The minute vessels cannot be thus acted upon without communicating to larger vessels in their vicinity an accelerated circulation; for if the former receive in a given time a quantity of blood greater than natural, the latter will, also, necessarily, receive a similar proportionate quantity, *as they are engaged in conveying to and from the capillaries what is essential to maintain their invigorated function.* These vessels may, indeed, be considered as placed between two points of the sanguiferous system, possessing very different relations, to them, *one bringing blood to them, and the other carrying it from them.* Hence it is impossible to change, to any considerable extent, the motion of the blood in the intermediate vessels, without, at the same time, giving rise to similar modifications in the larger ones. If the circulation in the capillaries is impeded and oppressed the others will necessarily be more or less disturbed. The effects which succeed the application of a stimulus differ, of course, *in proportion to the extent of surface which it occupies, and the degree of direct excitation which it produces.*

When only a small portion of the surface of the body is stimulated, the functions of the lungs are not at all influenced, because the sanguiferous system generally is unaffected; but if the whole of its surface is excited, the superficial vessels occasion in those deeply seated a corresponding alteration. A considerable quantity of blood being, in this case, withdrawn from the internal viscera, the circulation is much invigorated, and, consequently, the chemical changes in the respiratory organs are augmented. I am not aware that there is any material difference in the principles which regulate the motion of the blood in the capillaries on the surface of the body, and in those on the surface of the stomach; at least a difference sufficiently great to require a separate explanation of the phenomena occurring in both under similar circumstances. It may, indeed, be considered as an established law, that such vessels are excited and depressed by the same general causes. *The internal surface of the stomach, in consequence of the vital functions which it performs, receives a greater proportion of blood than a similar extent of surface on any external part of the body, and its vessels are also placed in closer and more intimate connexion with the lungs than those which are superficial.*

and will, therefore, more immediately affect these organs.

When a stimulus is conveyed to the internal surface of the stomach, its numerous vessels are excited to increased action, which quickly rouses the circulation in others that are contiguous, until, at last, its awakening power is communicated to those of the lungs, which cannot possibly be invigorated without the congestion which oppresses them being removed or diminished, and the blood becoming more thoroughly oxygenated. The stimulus may not only thus affect the respiratory organs, but, by absorption, excite the heart and the whole capillary system. There are no grounds for supposing that the stimulant, when absorbed, loses, in any degree, its general and characteristic qualities, and it is, therefore, probable it will exercise, wherever it is conveyed, an invigorating influence. The contraction of the capillaries, which partly occasions the motion of the blood, arises from certain relations, difficult to appreciate, existing between the chemical action of the circulating fluid and the inherent properties of these minute vessels. The more highly the blood is oxygenated, the more frequently the heart and the capillaries

contract; and the more venous its nature, the more feeble and imperfect is their action: from which we may infer, although we know nothing of the immediate cause of contraction, *that this phenomenon depends entirely on the qualities of the blood.* Though it is necessary to regard the action of a stimulus as twofold—its immediate influence on the vessels to which it is applied, and its operation on the capillary system generally by absorption, the latter is undoubtedly the chief cause of the modifications produced in the motion and properties of the blood. If the heart were alone strongly excited every improvement in its contractions would necessarily accelerate the circulation, so that the capillaries of the lungs, and those of every other congested organ, would gradually be relieved, and the natural conditions of the sanguiferous system be re-established.

That the capillaries are instrumental in the motion of the blood, seems highly probable from the fact, that there are no other organs in the lower gradations of animal life, and in certain extraordinary examples of monstrosities which can at all account for the continuance of the circulation. It may, perhaps, appear strange, that I have not considered

the direct influence of the nervous system on the motion of the blood, but there are very few, if any, decisive facts to prove that any such influence exists. If however, it could possibly be shewn by experiments, that the contractility of the heart and the capillaries is attributable to nervous energy, the accuracy of the foregoing observations would still remaim unaffected, because no inquiry has been instituted into the final causes of circulation. The argument has been confined to the tracing out of the obvious relations existing between the circulatory apparatus and the qualities of the blood. It has been shewn by several distinguished physiologists, that when particular capillaries have been some time excited by the direct application of a stimulus in experiments, they generally become debilitated, so that the circulation of the blood in them is consequently impeded, and at last arrested. This fact can scarcely be adduced in evidence of what takes place in the capillaries generally on the continued action of stimulants. Particular capillaries are affected directly, the capillaries in general indirectly, or at least by the stimulants conveyed to them through the circulation. There is likewise another striking difference between them. The capillaries in the one instance are

constrained, as the part on which an experiment is performed, whether the web of the frog's foot, or any other transparent membrane, is placed under circumstances which are alone calculated to modify the natural functions of these vessels, whereas in the other, there is nothing of this kind to influence the results.

Every stimulant has peculiar properties, and, consequently, a peculiar mode of operation. All, however, whether of a spirituous or diffusible nature, may be said to be distinguished by one quality, viz., a tendency to excite to greater activity the heart and sanguiferous system, and it might, moreover, be shewn, that when employed they are chiefly beneficial in proportion as they give rise to this effect. Purgatives, diuretics and alteratives might also be considered stimulants, if an increased action produced by them in any organ entitled them to this designation; but the term is restricted to remedies which affect, more or less, the circulatory powers generally, leaving out of consideration local applications, the greater part of which exert no direct influence whatever on the heart. It is not easy to point out the conditions of the animal system which unequivocally suggest the propriety

of employing internal stimulants, or clearly indicate the degree in which they ought to be used. These remedies may often be prescribed with advantage in cases of congestion and debility, though not invariably, because the good which they are calculated to produce depends very much on the length of time the morbid conditions have existed. If they are of short duration, the functions of the capillaries, being by no means seriously disturbed, frequently recover their natural tone and energy, when the vital powers generally are stimulated; but if on the contrary, they have continued several weeks, the invigorated action of the heart and sanguiferous system cannot affect the desired modifications in these vessels, and stimulants given at this time, consequently, very often excite inflammation in the organs previously deranged, the stimulated capillaries being unable to throw off the disease which oppresses them. Such remedies prescribed in fevers, occasionally cause a high degree of excitement which is, in many instances, unquestionably greatly injurious, not because a stimulant is detrimental, but because it has been given in too small a dose.

This doctrine may appear somewhat para-

doxical, but it has been corroborated by much personal observation, and may be easily shewn to be founded on rational principles. The beneficial influence of stimulants consists chiefly, as already stated, in rousing the congested capillaries to increased action : hence, when given in small quantity, these vessels are often not sufficiently excited by them to admit of their removing the accumulation of blood which impedes or arrests their natural functions. The stimulating plan of BROWN was successful in many cases, simply in consequence of the liberal doses prescribed; and I have seen many good effects produced, where patients have deviated from the strict regulations of the practitioner, by their having surreptitiously and abundantly taken some favourite liquor, from which they have been charged to abstain altogether. When stimulants strongly invigorate the action of the heart and sanguiferous system, as indicated by the full and bounding pulse, succeeded by profuse perspiration, they are generally useful. This last symptom is always favourable. The employment of these remedies in cholera was at once suggested by the great congestion existing in this disease, but it will be acknowledged by all who have tried them on an ex-

tensive scale, that they failed to produce the degree of benefit which was anticipated. In the early stage of the malady they were often of striking advantage, but in the symptoms of collapse, when the extremities and surface of the body are cold, and the pulse is scarcely, if at all, felt at the wrist, they rarely invigorate the vital powers, although abundant quantities of the most exciting kind be given in the course of a few hours. Ammonia, ethers, cajeput oil, and all the spirits in ordinary use have been often employed, but none of them certainly with any marked success. It sometimes appeared most extraordinary that the animal frame was so little susceptible of their influence; the cause of their inefficacy may, however, perhaps be satisfactorily explained in the following manner.

From the very general and severe derangement of the system, it cannot be doubted, that the ordinary functions of the internal organs are greatly disturbed, particularly those of the mucous membrane: hence, it is reasonable to suppose, that the stomach and alimentary canal are too much disordered to exercise with any thing like their usual activity, the important office of absorption. If this be ad-

mitted, it is easy to account for the slight degree of excitement succeeding the employment of stimulants in this disease. The numerous small vessels which in a healthy state of the body absorb, and convey into the circulation the various fluids in contact with them, are, at this time, *engaged in pouring out the nutritious qualities of the blood, so that these vessels are almost altogether occupied in carrying their contents from the heart, and not towards it, a fact which clearly shews the difficulty opposed to the absorption of stimulants or fluids of any description.* Were the action of the heart much excited, the probability is, that in the severe cases of congestion, it would be insufficient to rouse the circulation, the functions of the capillaries being too much disturbed to be greatly influenced by it, nor can these vessels, though considered as sources of motion, be said to co-operate powerfully with the heart, the load of blood, almost in a stagnant state, by which they are oppressed, not allowing them to receive freely the stimulants in the course of the circulation.

In the selection of stimulants it is well to be regulated by the habits of patients. Most of those attacked with the prevailing epidemic

are addicted to the drinking of spirits or malt liquor, and in the cases of this kind which came under my own treatment, it appeared to me advisable to indulge their taste in the selection of these stimulants, by so doing there is certainly a greater probability of success. My experience is by no means in favour of strong stimulants, or of large and frequent doses of them in the urgent symptoms of collapse. Ale and porter seemed at times much more efficacious than wine or spirits.

SECT. V.

An inquiry into the action of External Stimulants and a consideration of their efficacy in the treatment of Cholera.

Of the numerous remedies used in medicine there are few more efficient in the treatment of many diseases, or, indeed, so safe in their application as external stimulants. It frequently demands much discrimination to know when purgatives, emetics, and venesection may be employed with advantage, and if injudiciously prescribed, they are occasionally liable to produce much serious injury. It is less difficult to determine the morbid conditions that indicate the propriety of using external stimulants, which are attended with this additional advantage, that if they do not ameliorate the disease they rarely aggravate it. Medicinal substances received into the system exercise considerable influence on the important organs of life, either directly, as illustrated by the action of emetics and drastic

purgatives, or indirectly by nervous or sanguineous sympathy. The warm bath, and many other external stimulants have a direct action on the surface of the body, and the changes they produce in the circulatory system have an indirect, but extensive influence over the whole of the animal economy. The great quantity of blood drawn to the superficial vessels will necessarily relieve the congestions of the internal organs, and the relief thus produced is not partial but general. The invigorated circulation in the cutaneous capillaries, independent of the modifications which it causes in the properties of the vital fluid immediately communicates an excited action to other vessels more deeply seated. It has been shown in the "Experimental Inquiry," that the temperature of the body, and the oxygenated condition of the blood are altogether regulated by the frequency with which the mass of this fluid passes, in a given time, through the respiratory organs, and that whatever improvement is conferred by external stimulants, the greater part is entirely attributable to this cause.

From the manner in which such changes are effected it does not appear probable that

injurious effects will often follow even the unsuccessful application of these remedies. It is not necessary to enter into a separate consideration of the action of blisters, rubefacients, counter-irritants and poultices, or the various methods of applying external heat, for the influence exerted by them differs principally in degree, not in kind. It is, however, reasonable to suppose, that a severe blister may occasionally excite contractions in some of the internal organs, not by producing any partial or general modification in the sanguiferous system, *but by occasioning irritation in the muscular or contractile fibres of the organs directly affected.* This phenomenon sometimes occurs when a blister is applied to the abdomen; but the great benefit which succeeds its employment, in cases of congestion, whether acute or chronic, is chiefly referrible to the important changes produced by it in the distribution of the blood. Hence it is evident, that external stimulants, particularly the warm-air bath, are likely to be of incalculable service in the treatment of cholera. Their employment is evidently advisable in almost every stage of the disease. If the symptoms are extremely violent, there is no remedy so well adapted, as the warm air,

or vapour bath, to mitigate or remove them, being more than any other capable of acting at one moment on the same quantity of blood. If the powers of life are unusually oppressed, a longer application of the remedy will of course be necessary, than if they are only slightly disturbed, in order to remove the engorgement of the internal organs. The employment of the bath ought to be unremittingly persevered in until the circulation generally is invigorated, when it may be highly advantageous to abstract blood from the arm. It is observed by Mr. BOYLE, that "when the warm bath is of such a temperature as to be only agreeable to the person, the remedy appears to be altogether inert; but when from heat and the person's sensibility, remonstrance and even force is necessary to keep him in it, the result is usually favourable."

The warm air or vapour bath, applied in cholera, excites, perhaps, more pain than any other remedy, and this is one reason amongst others, why it has rarely been enforced to an extent sufficient to effect the desired purpose. If it had been perseveringly used, its efficacy would have been better known and more generally mentioned. The suffering which it

causes is said to arise from the acute sensibility of the patient. The animal system, however, at this time, displays less sensibility than natural to all external impressions, except heat, and why it should be peculiarly alive to this has not, to the best of my knowledge, been clearly explained. *External heat is borne by the animal system proportionately to the vigour of the superficial circulation.*

The heat is absorbed by the numerous capillaries on the surface of the body, and carried to the internal organs, a fresh portion of blood being continually supplied, which is acted upon and operates in a similar manner to the preceding, till the body at length becomes extremely warm, and a temperature barely consistent with the well being of life, is maintained by the profuse perspiration which takes place. In the collapsed stage of cholera, the superficial circulation is almost arrested, as proved by the cold and clammy condition of the surface of the body, and the absence of pulsation at the wrist; under these circumstances, the external application of heat, as it cannot be absorbed, must necessarily occasion acute pain by the intensity of its concentration. Great heat, applied to the surface of the body, can

be agreeable or borne only when the superficial circulation is sufficiently energetic to remove it in the manner previously described. This explanation of the difficulty of exciting the vital powers shews the necessity of persevering in the employment of the requisite means, until the sanguiferous system be fully invigorated.

SECT. VI.

An inquiry into the action of Mercury, and a consideration of its efficacy in the treatment of Cholera.

To enter into a detailed consideration of the operation of mercury, and to describe the various diseases in which it may be advantageously employed, would occupy much more time than can consistently be devoted to the subject in this Treatise: but the accuracy of the general physiological principles advocated in it will be illustrated, and the action of this particular remedy, perhaps sufficiently explained by a few observations. Mr. SWAN, as I have already stated in the first volume of this work, endeavours to shew, that mercury acts chiefly on the nervous system, not by its absorption and general diffusion through the blood, but by a sort of irritation which it excites. Many experiments are adduced in support of this opinion, and it is with regret I feel compelled to assert, that both the facts

to which he appeals, and the conclusions which he draws from them, are alike unsatisfactory. It would be an easy task to demonstrate, by the very same experiments, the absorption of mercury, and to prove that the various morbid effects produced by it are occasioned by its transmission with the circulating fluid throughout every part of the animal economy,—the very reverse of what he attempts to establish. In those cases in which the sympathetic nerve and par-vagum were particularly enlarged or affected, the whole, or the greater part of the chylopoietic viscera were much more vascular than usual as well as the lining membrane of the brain and spinal cord. The following experiment is given exactly as it is stated in his work, not because it is more opposed to his views than the rest, but as, in his own opinion, strongly in favour of them, and as a fair example of their general character. The one succeeding this, to which I shall merely allude, is, according to his own acknowledgment, at variance with all the rest, where active mercurial preparations have been used.

"Exp. xii., March 21, 1823.—At a quarter before eight A.M. I injected one grain of

oxymuriate of mercury, dissolved in an ounce of water, into the left jugular vein of a large dog, eight months old. He died on the 24th.

EXAMINATION.—All the ganglia of the grand sympathetic nerves were inflamed, but not in the same degree as in the preceding experiment. The right superior dorsal ganglion was inflamed in a greater degree than any of the rest. The right semilunar ganglion was more inflamed than the left. There was more redness of the par-vagum than in the preceding experiment. The ganglia of the fifth pair of nerves were more red than natural. The medulla spinalis was healthy, but its pia mater was too vascular. The nerves forming each axillary plexus were much more vascular than natural, but near the elbow no vessels could be distinguished. The sciatic nerves were not so vascular as those of the axillary plexus. The inferior lobe of the right lung was purple and solid; the superior lobes had purple spots on them, but they were not solid. The left lung had purple spots on it, and its inferior lobe was the most affected, but it was not near so much diseased as the right. The liver was much darker than usual, and I supposed it was inflamed. The pancreas *was much more red than natural. Neither the stomach nor small intestines had any*

*redness on their villous coat, but the mucous coat of the rectum and bladder was very red. The stomach and intestines contained an unusual quantity of bile. There were several red spots on the inside of the cheeks, but there was not the least ulceration. The absorbent system appeared to be in a state of irritation."**

It is difficult to imagine how Mr. SWAN could found such a theory as his, on cases in which there evidently existed so much general disease, and his doing so is a striking proof of the facility with which the mind adopts, without sufficient reason, whatever is consonant with its own preconceived notions, as well as of its utter inattention to striking and important facts, when it is strongly biassed by its own prepossessions. The submuriate of mercury, to which my remarks will now be confined, is, in whatever quantity it is taken, a *stimulant*. When given in a large dose, it acts principally as a purgative, producing so much irritation in the bowels, as to excite copious secretions and frequent evacuations; in small and repeated doses, it operates as an alterative, being gradually absorbed and conveyed to different organs, the functions of which are slowly but generally af-

* An Inquiry into the Action of Mercury. p. 55.

fected. There is, however, an obvious and important difference in the manner in which mercury and the class of internal stimulants, previously considered, act. These stimulants invigorate the contractions of the heart and capillaries, promoting a more equable distribution of blood, and more extensive chemical changes in the lungs, in consequence of which a grateful stimulus is communicated to every part of the body, which tends to remove any existing congestion, and to infuse new energy into the various functions of animal and organic life. Whatever excites the action of an organ is, strictly speaking, a stimulant, and it cannot be disputed, that calomel operates as such, though not chiefly and immediately by accelerating the motion of the circulating fluid, *but by its absorption, general diffusion and action on every part of the capillary system.* If given in a large dose, uncombined with opium, the great irritation which it produces occasions frequent evacuations, so that the greater part of it is thrown off from the body before it has had time to be absorbed. Calomel has seldom been prescribed with any decided success in the treatment of cholera, except in combination with opium, or during the employment of both external and internal stimulants; it is,

therefore, extremely difficult, if not altogether impossible, to ascertain the kind and degree of influence it exerts under these circumstances. Its beneficial effects are certainly not attributable to its action as a purgative, which alone would be incapable of removing the existing congestion and the fearful prostration of the powers of life ; for, though in cases of fever of a typhoid character, and in low nervous affections, the removal of feculent matter and morbid secretions from the bowels is occasionally succeeded by an extraordinary improvement of symptoms, it will not be followed by a similar improvement in cholera. Calomel, in doses of twenty grains, alone or in combination with opium, was first prescribed in cholera, occasionally with surprising benefit, in India, and when the disease appeared in this country the same remedy was adopted, but with comparatively little success : many, indeed, consider it to have been rather injurious than beneficial. After the epidemic had prevailed in England some time, it was more common to give small and frequently repeated doses of calomel, perhaps one or two grains every half-hour or every ten or fifteen minutes : a mode of administering it which seemed preferable to the other.

It must, however, be acknowledged, that even this was by no means generally efficacious: though under certain circumstances, my experience furnished me with abundant proof of its utility. In those instances in which the extremities and surface of the body were extremely cold and clammy, the tongue cold and red, or white and clean, the other appalling symptoms of collapse existing at the same time, this remedy exerted little, if any salutary influence: often, indeed, it seemed injurious, causing the patient to sink much sooner than he would have done had he been left altogether alone. When, however, the tongue was considerably furred, though it might be cold, and the vital powers much depressed, small and repeated doses of calomel were often of striking advantage, gradually but permanently exciting the animal system to increased action. It should also be remarked, that the secondary symptoms of this disease were much more tractable and speedily removed in cases which had been treated with calomel, than in others in which different means had been employed. The truth of this fact was fully corroborated by daily observations on an extensive scale. When calomel had not been prescribed, local and acute inflam-

mations were frequent occurrences, and the whole animal economy, indeed, very slowly recovered its natural energies. In those cases in which it had been used, the secretions, especially those of the abdominal viscera, were soon re-established, and the restoration of health was rarely very difficult or tedious. The symptom, which chiefly indicated the propriety of employing this remedy, *was the furred tongue, apparently connected with a morbid condition of the body of a very different character from that which exists when this organ is clean and red or indeed white*:—a circumstance, which accounts for the salutary influence of mercury on one occasion, and its inutility on another.

The latter appearances of the tongue were generally observed in persons of debilitated constitutions, arising either from debauched habits, poor living, or severe purging of several days' continuance; and the urgent symptoms of collapse are mostly associated with an extremely exhausted state of the body, by whatever cause it has been produced,—a state which not only requires stimulants to rouse the oppressed organs, but to endow them with energy sufficient to regain their ordinary powers, which, however, are seldom restored

by any combination of means. This condition of the animal system is not so much a sudden and extensive engorgement of the internal viscera, as a naturally enfeebled state of it, connected, of course, with a certain degree of congestion. The *furred* tongue has generally been observed in persons whose digestive organs have been disordered for several days, but whose constitutions have not been debilitated by the causes above mentioned, equally with those of others in whom the tongue presents a different appearance; and hence the vital powers being naturally more vigorous in such persons, the employment of calomel will probably be attended with much more favourable results. By a gradual and slow absorption it stimulates the congestive or otherwise morbidly-affected capillaries to increased action, which, suffering more from simple congestion than from deeply rooted debility or want of healthy tone, are thus enabled to recover their usual functions.

The difference here pointed out between these two classes of cases, whilst it accounts for the dissimilar effects succeeding the action of mercury in different patients, will also explain why it has generally been more success-

ful when employed in the treatment of the epidemic in India than in England:—the results of this practice in the former, so far as we have been made acquainted with them, being derived mostly from cases occurring amongst persons belonging to the civil or military establishments of the East India Company, who, from the regularity of their habits or mode of living, possessed considerable constitutional vigour, and, therefore, probably exhibited those morbid conditions in which calomel, as already stated, exerts a favourable influence. But even admitting that the results of the practice are furnished by cases observed among the natives, as it is stated that diarrhœa did not so generally precede the appalling symptoms of collapse in the East as in this country, the animal system, previous to the stage of depression, would consequently not be so exhausted as to preclude, on many occasions, the beneficial action of this remedy.

The inutility of calomel in the worst forms of the disease occurring in debilitated constitutions depends, not only on the circumstances mentioned, but partly, also, on the impediments opposed to the absorption of

the substance, which must be great in consequence of the enfeebled circulation, and the tendency of the capillaries of the alimentary canal to pour out their contents rather than to take up any thing in contact with them. Were this circumstance regarded as the cause of the inutility of calomel in such cases, the practical bearing of the foregoing distinctions would be little affected, because, considered as they may justly be, as indicative of a greater or less degree of disturbance of the vital energies, they may not only regulate the application of means, but satisfactorily account for the different results obtained by those means.

SECT. VII.

The utility of Galvanism in the treatment of Cholera.

In the urgent state of collapse no remedy is, perhaps, so well calculated to rouse the animal system as Galvanism. I have not the least hesitation in asserting, that it will often excite the circulation when all other means have been tried in vain, though even in that case it frequently fails in restoring health. It has been stated in a previous part of this work, that the little benefit which has followed the employment of many remedies in this disease, is in a great measure owing to the exhausted state of the body occasioned by poor living, impure air and the distressing effects of vomiting and purging, *rather than any extraordinary or sudden accumulation of blood in the internal organs.* Galvanism, applied in cases in which such accumulation predominates, causes permanently good effects for the very same reason that the operation of

other remedies is favourable, though such effects are rarely produced in cases characterized by great exhaustion. It generally, however, succeeds even in these cases in exciting the circulation—restoring the pulse at the wrist, and diffusing additional heat throughout the body—symptoms which gradually disappear on the discontinuance of its application, the existing vital fluid being too impoverished in quality, or too deficient in quantity, to resuscitate by its slightly invigorated motion the enfeebled powers of life.

From these remarks, which are founded on actual observation, it would appear advisable to employ Galvanism in the earlier stages of the disease, before the animal system is too much reduced by its copious excretions to allow the successful operation of this or any other remedy. Its application should also be continued much longer than has usually been deemed necessary from the improvement almost immediately effected by it in the circulation. It is acknowledged by those who have employed Galvanism in this disease, that those occasions on which it has failed to be useful, have been when it was applied to old or emaciated con-

stitutions, or when its application has been made in the too advanced stage of collapse—facts strongly corroborative of the explanation here given of its action.

External and internal stimulants must be used in conjunction with this agent, for alone it might be insufficient to arouse the system even in the most favourable cases: and it is, indeed, stated by some writers, that the combination of stimulants with it was found necessary to ensure success.

To persons unacquainted with the best construction of a galvanic battery, and the proper mode of applying it so as to produce the greatest possible effect on the human frame, the following remarks cannot be unacceptable:—

"In the first place, I think the *construction* of the battery of some importance. I have tried all sizes, from plates of six inches square, to those of one inch; and I find that plates two and a half inches square answer the best for medical purposes. A series of twenty double plates (zinc and copper, well soldered together at the upper edges) of that size, carefully cemented into a mahogany trough, constructed on the plan of Cruikshanks, and mounted according to Dr. Hare's improvement, as described in Mitchell's edition of Faraday's Chemical Manipulations, page 484 (note), forms a convenient battery for ordinary use, and will be found sufficiently powerful to be borne by most patients. It would be well, however,

to construct the trough for a series of thirty or forty pairs of such plates, as it may be necessary, in some cases, to increase the power to that extent. The space between each pair of plates ought to be at least half an inch, otherwise the acid mixture for charging, will be too soon exhausted of its strength. Great care should be taken that the cementing be *perfect*. I have been in the habit of using a cement made of five parts of rosin, four of bee's wax, and two of pulverized red ochre, and pouring it, while hot, into the troughs, after the plates had been carefully arranged and fixed in the grooves; so that the sides and bottom of the trough between each pair of plates may be completely covered with the cement, about one line in thickness; thereby securing a perfect insulation of each pair of plates. In each extreme cell, also, the wood should be completely covered with the cement. After the cement is finished, the troughs should be well varnished with two or three coats of good copal varnish. Small silver wires, three or four feet long, for conductors, may be prepared by attaching a leaden ounce ball to one end, so that it may readily sink in the cells, and keep its place; and the other end may be armed (to insulate it for holding between the fingers) with a tube made of a large goose-quill by cutting off the ends, fitting a piece of cork into each, and then thrusting the wire through them, so that the end will project about one inch; or some of the melted cement may be poured into the quills, to secure the wires in the centre, instead of the corks. Two-third circular plates of silver, about the size of a dollar, with six or eight small holes perforated near the margin for the purpose of sewing on some thick woollen cloth, or a flat piece of sponge, should next be prepared. The battery may then be filled to within half an inch of the tops of the plates, with a mixture of muriatic acid and water, in the proportion ef one part of the former to fifteen or twenty of the latter. I have found this mixture preferable to any other for medical purposes.

" Thus provided when called to a patient with the Cholera, I would apply one of the silver plates to the nape of the neck, and the other to the pit of the stomach; the cloth or sponge on both plates being previously well moistened with the acid mixture for

charging the battery. This moistening of the plates with the acid mixture is very important to be attended to, as an action of the skin is thereby produced, which gives a ready passage to the galvanic influence. I would then bring the armed ends of the wires, (the other ends being plunged into the cells of the trough, at such distance a-part as to produce the desired intensity of action), in contact with the plates, and maintain as strong an application, for eight or ten minutes, as the patient could bear without complaining. Sometimes the positive and sometimes the negative, wire will produce the most pungent sensation. I would occasionally reverse them, so that the strongest sensation should be felt at the pit of the stomach, or in whatever part the pain might be most severe. If the pain and spasm should extend over the whole region of the abdomen, I would occasionally let one plate remain on the pit of the stomach, and shift the other to various parts of the abdomen where the pain might be severest; or, perhaps, a large plate fitted to the whole region of the stomach and bowels (lined with cloth or sponge, and well moistened as before directed) might answer the best purpose."—L. MUNSELL, M.D., *of Frankfort, Kentucky.*—*Lancet* 1832—*p.* 714.

SECT. VIII.

The utility of the Muriate of Soda in the treatment of Cholera.

AMONG the numerous remedies, extolled for their efficacy in curing this disease, the Muriate of Soda is represented as having high claims on our attention, not less on account of the extraordinary effects which are said to follow its employment than the chemical principles which are adduced in explanation of its action. Had it not been associated with these principles, its employment would have been empirical though still worthy of notice. If the reasoning with respect to them be correct, as they will in that case, necessarily suggest its employment in many other diseases, the importance of this remedy is greatly increased. Common Salt is supposed to afford oxygen to the blood, and has hence been regarded as beneficial in congestive affections, in which the properties of this fluid

are deteriorated, and its salutary operation in Cholera is perhaps owing to this chemical action.

The observations and experiments of Dr. STEVENS on this subject are extremely valuable; but the success which he states to have succeeded his own employment of it in this disease is immeasurably greater than has attended the use of it by others. To an impartial reader of the controversy between Dr. STEVENS and his opponents, it will probably appear that the cases treated by this intelligent physician were not of that decidedly collapsed character which, whether occurring in this country or abroad, have been scarcely at all relieved by any means whatever. However this may be, it is an undeniable fact, that this remedy has not been found peculiarly efficacious during the existence of the most urgent symptoms of the disease.

I repeatedly tried the Muriate of Soda in the Hospital with which I was connected during the ravages of the epidemic in Sheffield, but not successfully in any single instance *in the stage of collapse characterized by*

great depression of the vital powers; though I strictly attended to the quantity of the doses, as well as its combination with Chlorate of Potash and the Carbonate of Soda, as prescribed by Dr. STEVENS himself. It appeared useful, however, in the slighter forms of the disease, in which the pulse at the wrist was felt without any difficulty, though the extremities and surface of the body might be somewhat cold. It must, at the same time, be kept in mind, that cases of this description were in general successfully treated by other means, so that even on these occasions there was no superiority observed in the efficacy of this remedy to entitle it in any degree to the character of a specific. Its employment was discontinued in the most alarming forms of the disease, because it did not appear to produce any sensible effect whatever. Common Salt is a remedy which I have prescribed very extensively in private practice for many years in dyspepsia, and sometimes with very great benefit. It cannot, therefore, be supposed, that from ignorance of its virtues, or from any undue prejudice, I should fail to give it every possible chance of success in the treatment of Cholera.

In previously noticing the action of Calomel, it was stated, that it was decidedly useful in those cases in which the tongue was furred, or in other words, during the existence of the less urgent symptoms of the disease, and the Muriate of Soda is serviceable in similar cases, though scarcely to equal extent.

The same reasoning which was employed to account for the very limited utility of the former in the most distressing cases, will also, explain the failure of the latter: neither remedy can be of any service unless it be absorbed, and, there is little probability that absorption will take place during incessant vomiting or purging, accompanied by extreme exhaustion of the vital powers, or an inordinate accumulation of blood. The existence of either of these conditions will satisfactorily account for the want of success attendant on the employment of this remedy. The medical profession is, however, greatly indebted to Dr. STEVENS for the light which he has thrown on its action, apparently proving that it supplies the blood with oxygen, and may, therefore, be often employed with advantage when this fluid is deficient in its ordinary invigorating properties.

SECT. IX.

The Physiological Principles of Broussais and a consideration of their efficacy in the treatment of Cholera.

In the foregoing pages the action of venesection, and its efficacy in the treatment of this disease, are generally considered, but this subject is so important, especially in connection with the physiological principles of Broussais, as to require a further examination. There is much that is objectionable in the writings of this eminent physiologist, arising in a great measure from his too generalizing spirit; there is, however, much also to be admired. One of his great errors, is referring almost all disorders of the animal system to inflammation, and in no part of his works is this error more apparent than in his observations on Cholera. "From analogous facts," he remarks, "which I have observed at different epochs, and in different countries, I have attributed the want of pulse, (asphyxia),

and the brown or blue colour of the skin and mucous membranes, (cyanosis), to a general inflammation of the mucous membrane of the digestive tube :"* and in a passage immediately preceding this, he says, " I conclude from the foregoing observations, that Cholera is a disease *eminently* inflammatory."

It will be evident from an attentive examination of his principles, that he has been led to the adoption of this opinion from two circumstances : *the benefit occasionally derived from the employment of antiphlogistic remedies, and appearances discovered on dissection.*

It may, perhaps, be satisfactorily shewn, that neither of these circumstances authorizes such a conclusion. Very opposite modes of treatment have been proposed by distinguished writers, and, as evidence of their correctness, the success attendant on the application of them, and the morbid changes discovered on dissection, have been repeatedly adduced. Such evidence, however, is only valuable as affording a wider range of observation and ex-

* The epidemic Cholera observed and treated according to physiological principles. Trans. from the French of Broussais, by G. Dunn, Esq., Surgeon, Doncaster.

periment to assist the philosophical inquirer in his investigation of the true nature of this disease, the causes of its production, and the principles calculated to ameliorate it, than more circumscribed views of it would furnish. There is, perhaps, no disease so liable to important modifications from constitutional differences, and various exciting and predisposing causes, as Cholera; and hence it may be shewn, that, in many instances, it is impossible to refer its appalling phenomena to a decidedly inflammatory action. What similarity is there in the nature of the disease as manifested in the two following cases, or with what propriety could the same line of practice be pursued in both?

Case 1*st.*—An individual belonging to the lower classes of society, whose constitution has been undermined by dissipated habits, is affected for some days with urgent diarrhœa, until at length great debility is induced: when at this moment the symptoms of Cholera immediately supervene, such as distressing sickness and vomiting, constant purging, violent cramps, a blue appearance of the whole surface of the body; the pulse unfelt at the wrist, and total prostration of strength.

To draw blood from the arm is impossible, and the application of leeches to the pit of the stomach, and the gradual melting of ice in the mouth, will rarely be found, to a patient thus afflicted, of the slightest benefit. Indeed the attempt to diminish the little remaining energy of the vital powers by any depletory measures is unphilosophical in its aim and injurious in its consequences.

Case 2nd.—A person of moderately good constitution and sober habits, is suddenly attacked by the prevailing epidemic, apparently excited by great depression of spirits—fatigue or sensual excess. A copious abstraction of blood from the arm, an application of leeches to the pit of the stomach, or an emetic, will sometimes remove at once the urgent symptoms, and the patient by the next day is so far recovered as to feel only a slight degree of debility. These two cases are designated by the same name, but what similarity do they present in a pathological point of view, or with what propriety can the same measures be adopted in each? It is true there is vomiting in both cases—cramps of the lower extremities—little if any pulse at the wrist, and a somewhat blue appearance of

the body. In the one case the individual, in consequence of dissipated and irregular habits, or the want of good and substantial food, is possessed of scarcely any vigour previous to the attack of diarrhœa, which will be admitted as causing great expenditure of the vital energies: in the other, the habits of the patient and his mode of living have not produced any antecedent constitutional debility or disease. The two cases then, in a strictly pathological point of view, will be acknowledged to be very different, and the employment of the same measures will not, therefore, be likely to ensure an equal degree of benefit in both. The appalling prostration of strength in the former case is unquestionably accompanied with congestion of the internal organs, though, perhaps, comparatively insignificant in extent, *the body being already exhausted of its fluids.* Will the application of a few leeches to the pit of the stomach resuscitate the sinking energies, or will the melting of a little ice in the mouth satisfy the urgent demands of the animal system? The former will often accelerate the fatal termination, because it cannot so influence the circulatory apparatus, *as to put in motion the blood determined to the internal organs, and failing to effect this, it will necessarily hasten*

death: the latter is perhaps the best means that can be enployed for quenching the distressing feeling of thirst. The inefficiency of the application of leeches in such cases, my own individual experience and that of others, which has come to my knowledge, has on many occasions undeniably proved. Is the failure of such application to be attributed to the extent of the inflammation, or *the great constitutional debility produced by sensual excesses, impoverished living, and the pre-existing diarrhœa?* The mucous membrane of the alimentary canal is generally, in cases of this kind, found on dissection to be variously diseased, being in one part quite pale and softened, in another unusually vascular, in a third, though this is a rare phenomenon, presenting small circumscribed gangrenous patches—appearances which may be supposed to demonstrate an inflammatory action. They prove, that the membrane has undergone considerable changes, but the greater part of these may be explained without reference to a decidedly inflammatory action as the *primary* cause. It frequently happened during the prevalence of Cholera, that persons who had retired to rest quite well, were, in a few hours, seized with severe vo-

miting and purging, violent spasms, and great prostration of strength. A sudden and extensive determination of blood to the internal organs would inevitably produce great disorder in the numerous capillaries, exciting them to greater action, by which fluids of an irritating quality would be poured out in abundant quantity, the tendency of which is to modify, in various ways, the natural condition not only of the mucous membrane, but of all the internal organs.

It is explained in a previous part of this work, in what way different causes produce Cholera, and it is necessary to keep constantly in mind the principles already laid down, in order to form just conceptions of its nature. It has been shewn to arise from causes acting without the body, such as cold—to succeed immediately the inhaling of noxious effluvia, and to be excited by food difficult of digestion. These causes, though in their nature extremely different, produce the same general morbid effects,—*internal congestion, which is quickly followed by irritation that excites vomiting and purging.* It is contended by BROUSSAIS, that in all these cases, Cholera "is eminently an inflammatory disease, and that it is only to be

treated successfully by the abstraction of blood either generally or locally, and by the employment of antiphlogistic measures: but even if it were an inflammatory affection, similar in its nature to diseases *properly* so called, though not epidemic in their character, attacking any portion of the aliamentary canal, it would not be difficult to prove, that the practice recommended by BROUSSAIS would not by any means be sufficiently active to subdue it, whilst the stimulating plan of others would certainly be much more fatal in its application than it is asserted to be even by BROUSSAIS himself. If Cholera then differs essentially from inflammatory diseases, it becomes an important inquiry to determine in what the difference consists. In acute inflammatory diseases, seated in any part of the alimentary canal, the circulatory powers do not at once almost entirely cease, nor are the vital energies generally enfeebled as in Cholera. Perhaps it may be urged in explanation of these peculiar symptoms in the latter disease, that the inflammation accompanying it is much more severe than in the former. Were this the case, the treatment must necessarily be more active in proportion to the severity of the disorder, to ensure its success: but that recommended by

BROUSSAIS is much milder. Would a few leeches applied to the pit of the stomach, and the solution of ice in the mouth remove acute inflammation of the mucous membrane? Every practitioner knows, from his own experience, that they would not. I have tried the application of leeches, and seen others try it, in the worst forms of the epidemic, but certainly with no decided advantage. In the appalling cases of this malady, occurring in debilitated constitutions, the fluids of the body are considerably diminished by vomiting and purging, and what remains after these evacuations, is, for the most part, accumulated in the internal organs. In the less severe cases, the fluids are not so greatly reduced in quantity as they are modified in distribution. In the former, medical aid, whatever be the nature of it, is seldom of much benefit; since, however wisely administered, it is almost as little capable of putting in vigorous motion the feebly circulating blood as supplying the deficiency of that which is lost: hence the application of a few leeches to the pit of the stomach and the melting of ice in the mouth, being unable to cause either of these effects, will very rarely be of service. In the latter, these means, as well as other modes

of treatment, will frequently produce favourable results. BROUSSAIS has not pointed out this important distinction between the two classes of cases, nor has he shewn the difference between them and acute inflammation of the mucous membrane occurring under ordinary circumstances. Acute inflammation in its first stage is *excited action of the part affected, without being necessarily conjoined either with great internal congestion or diminution of the circulating fluids;* but one of these conditions, if not both, invariably co-exists with the irritation of the mucous membrane in Cholera. In acute inflammation of this membrane, the morbid action is mostly limited to a comparatively small portion of it. In the worst cases of the epidemic, the mucous membrane is often found pale and exsanguineous—appearances not generally attending acute inflammation; and they are acknowledged by BROUSSAIS to have been observed in many of the dissections performed at his request by M. HUSSON. The whole extent of this membrane generally exhibits deviations more or less considerable from a perfectly healthy condition, which is not extraordinary, when it is considered, that the very abundant secre-

tions poured out by it, will, *by disordering its important functions, necessarily injure its structure.* It is to this circumstance, and not to inflammation existing previously to or accompanying the urgent vomiting and purging, that the greater part of its morbid changes are to be traced. We cannot, then, appeal to these changes, as evidence of an *eminently* inflammatory action, constituting the nature of the epidemic. With as much reason the hepatized state of the lungs, consequent on acute inflammation, might be adduced as an essential element of such disease. In both instances, they are chiefly effects. If the extreme and sudden depression of the circulatory powers were caused, as it is asserted, by acute inflammation, its cure would always be somewhat tedious, whereas the patient suffering from such depression is sometimes as quickly relieved by emetics, stimulants, or the warm bath, as he was attacked. Would the two first remedies — remedies strongly condemned by BROUSSAIS—be likely to act beneficially in acute inflammation of the mucous membrane? He alleges, as incontrovertible evidence of the justness of his views, the success of his practice :—a mode of appeal too common and po-

pular to be admitted as conclusive. Without, in the slightest degree, impugning his veracity, or that of the talented practitioners in this and every other country, who boast of their truly miraculous success in the cure of the disease, by their own exclusive and very opposite methods of treatment, we may claim the privilege of doubting their general application, especially as we can assign reasons for our scepticism:—"By these means," (which were antiphlogistic,) says BROUSSAIS, "I have obtained considerable success, since I scarcely lost one patient out of forty after my method of treatment was well regulated. We began at the Val-de-Grace by one loss out of three; then one out of six; and the proportion of cures has since increased up to this day."* The proportion of cures would be an unerring criterion of the excellence of the practice, providing the patients presented, in all the cases, the same severity of symptoms: but this fact is not asserted, neither can it by any possibility be ascertained. As physician to a large Cholera hospital, I had abundant opportunities of observing important modifications in the character of the cases treated at different periods,

* P. 32, Opus Cit.

and these modifications were sufficiently great to convince me, that such a criterion, as that of successful practice, is extremely fallacious. At the commencement of the epidemic, and, in fact, for some time after, the reluctance to enter a hospital was great, and the majority of those who were brought to it would therefore probably constitute the worst cases, both for the urgency of the symptoms and the dissolute habits of the individuals. Under such circumstances the proportion of cures would be awfully small. This reluctance after a time greatly diminished, so that many persons were induced to apply for medical aid before the really appalling symptoms appeared; hence the proportion of cures would be great, but would certainly afford no proof of the superiority of the practice.

Without taking into consideration these and other circumstances, it is scarcely possible to explain satisfactorily, the striking difference in the success of the treatment pursued by BROUSSAIS at two different periods. At the first he lost one patient out of three, and ultimately only one out of forty, the method of treatment being at both periods precisely the same, except that in the latter

instances, it is said "*to have been well regulated.*" It is scarcely possible to imagine how the simple remedial measures, employed by him, could be so grossly neglected as to be the *sole* cause of such an awful destruction of life. Whether these observations be well-founded or not, it may be fearlessly stated, that the practice found so successful by him was not, in the hands of others, by any means equally efficacious. It is, indeed, a melancholy fact, that the numerous vaunted remedies—the specifics of empiricism—have not been found by the profession at large, in any degree so salutary in the treatment of this formidable epidemic as they had been represented by their eulogists. It would be an ungracious task to point out the various causes of this disappointment. The strong desire manifested by the profession to try every newly announced mode of treatment, shews more clearly than any other fact, *the want of an intimate acquaintance with enlarged physiological principles.* Persons groping in darkness turn with eagerness towards the faintest glimmerings of light. It is stated by BROUSSAIS, and with truth, though the causes of the fact is not explained by him, that those who were suffering from acute inflammation of the

lungs, during the prevalence of the epidemic, were not attacked by it. *This disease, as already stated, is produced by causes which greatly depress the vital powers, and therefore an excited action of these powers, whether arising from exhilarating emotions, invigorating pursuits, or acute inflammatory affections, especially those seated in the respiratory organs, tends to counteract any depression, the invariable precursor of the urgent symptoms of the malady.*

It is not my intention to point out the precise circumstances which ought to regulate the employment of the anti-phlogistic treatment of BROUSSAIS. They can scarcely fail to be understood by the intelligent reader from the preceding investigations. My object has been to shew that the practice which he lays down, as alone applicable to this disease, is not founded on a correct knowledge of its nature. To be adopted with advantage, it demands at every step of its application great discrimination. The morbid conditions, in one instance, might be relieved by it, but in another they might be seriously aggravated.

SECT. X.

Utility of Saline venous injection in the treatment of Cholera.

AMONG the multiplicity of remedies recommended in the aggravated forms of this disease, the transfusion of saline matters is one that merits attention. There can be no doubt that many instances of recovery were entirely to be ascribed to its employment. The few cases treated by it, which fell under my own observation, were not illustrations either of its utility or inefficiency, the experiment being clumsily and imperfectly performed, and when the patient was in a moribund state. As already observed, in the foregoing pages, to insure the success of any remedy, it is necessary to perceive clearly the object it is intended to effect, and the conditions essential to its accomplishment. The remarks made on this subject will, perhaps, not be altogether uninstructive. The conditions of the animal

system in collapse are exceedingly unlike in different cases. *In one, it may be conjoined with great exhaustion of the circulating fluids; in another, with the sudden and excessive internal accumulation of them.* These are important differences, which must be justly appreciated, in order to determine the occasions proper for the employment of saline injection. In the former condition, the vital powers gradually cease from the loss of fluids essential to their continuance, and the congestion of what remains, which, from being withdrawn from its ordinary channels, is almost equivalent to a positive loss. Transfusion is perhaps well adapted to such cases only. The matters injected will not permanently resuscitate the flickering powers of life, *unless they throw into circulation* —on their doing which depends the success of the experiment—*the mass of blood almost stagnant in the internal organs.* They often partially effect this, and from the immediate improvement produced in the feelings and symptoms of the patient, the most sanguine hopes are excited of ultimate recovery, which, however, generally prove illusive. The heart and circulatory system are roused by the warmth of the injected fluids, and as this is speedily dissipated, when the vital powers

are not vigorously brought into play, the tendency to relapse into the previous stage of collapse can scarcely be considered an unexpected result. It is stated by all who have employed saline injections, that they produced a decided amendment, though only for a short time, in many cases: and it is imagined, that if the means had been applied earlier, recovery would have been the consequence. If we picture to ourselves the congestion existing throughout the whole system—and congestion, too, of blood destitute of its ordinary vitalized properties—the inefficiency of the experiment will not be a matter of surprise. The difficulty of removing congestion *is proportionate to its extent—the length of time it has continued, and the degree of deterioration of the mass of blood.* All the processes, or changes of organization, are effected in capillaries, and when these are deranged universally, and in such a manner as to incapacitate them for the performance of their functions, it is easy to conceive the obstacles opposed to any immediate change in them, either by transfusion, or indeed by any other means. In the greater number of the cases treated by venous injection, the conditions of the congested capillaries are not materially improved. The saline matters pass

readily into the larger vessels, as is evident from the invigorated action of the heart, and the return of pulsation at the wrist; *but the congestion of the important organs of life is not greatly diminished.* Unless a considerable portion of the blood, thus accumulated, is thrown into circulation, the improvement directly succeeding the experiment will necessarily be of short duration. The composition of the injected matters, however accurately made, according to analysis of the blood, *must be regarded much less as a substitute for this fluid than as a stimulus to put it in motion.*

It is interesting to examine, whether the general failure of the experiments is not principally to be ascribed to an erroneous or imperfect conception of their action, and of the means calculated to increase their efficiency. *One cause of the failure has been the injection of too large a quantity of fluid.* The exhaustion of the animal system, by frequent vomiting and purging, seemed to indicate that the loss thus occasioned must be artificially supplied to a proportionate extent. Agreeably to this idea many pounds of fluid were injected, which it is admitted, escaped in many cases into the stomach and bowels as rapidly

as it was introduced into the system. When this effect did not accompany or immediately follow the injection, it occurred after a temporary improvement in the condition of the vital energies, and death quickly succeeded. A plethoric state of the body, produced in this manner, does not appear well calculated to rouse the almost stagnant mass of blood into motion, but on the contrary, rather to prevent it. The general congestion, or distention of the system, caused by the experiment, is not adapted to remove that previously existing. Were the fluid thus added, healthy blood, and subsequently maintained of a proper temperature by chemical changes in the lungs, a very different result might follow. The capillaries and the whole of the arterial system would be stimulated, especially the former, in consequence of which, and the gradually augmenting impulse *à-tergo*, their contents would be urged forward in their respective natural directions. But how is the congestion produced by the injection of saline matters likely to operate? These, when injected, are above the usual temperature of the body, and many degrees above that in the stage of collapse.*

* The temperature of the fluids injected was frequently as high as 115 degrees.

It cannot be supposed that the lungs will immediately be brought into vigorous action. They suffer in common with every other internal organ from the congestion of blood. It is therefore evident, that the ordinary chemical changes in the lungs cannot possibly be effected at this time. Such being the fact, how will the injected fluid act, or how will it be modified by the existing conditions of the body? It will, in the first place, diffuse considerable warmth throughout the animal system, and this is what is experienced by the patient. This warmth, however, in the majority of instances, will only be temporary. The lungs, as just stated, cannot be regarded as capable of maintaining this degree of heat, *and consequently the fluid will be gradually cooled by the lower temperature of the body.* This effect is inevitable in the greater number of cases in which saline injections are employed, and explains the liability of failure in the experiment. As it does not succeed in re-establishing the healthy functions of the lungs, the injected fluid becomes rather distressing than otherwise to the system, and is ultimately discharged by vomiting and purging. The quantity of fluid injected at once should be only a few pounds, and other means conjointly should be employed

to secure greater success. One of the most efficient is galvanism. When the vital energies are only slightly invigorated by cautiously regulated transfusion, galvanism should be promptly and perseveringly applied. It will tend most powerfully to rouse the circulation, and will thus co-operate with the injected fluid in diminishing the internal accumulation of blood; and, what is also of great importance, will facilitate an intimate mixture or blending of the two. The application of external heat, by means of the hot-air, vapour, or warm-water bath, will likewise be exceedingly beneficial. The agreeable warmth succeeding transfusion is no objection to the continued application of external heat, though it may, perhaps, be regarded in this light. The heat, it must be recollected, is, in this case, not created from within, but is introduced from without; and, as the success of the experiment depends on promoting the internal generation of it, all means which stimulate the superficially seated capillaries, and maintain their excited action, will strongly co-operate in the accomplishment of the object. Galvanism, external heat, friction, and internal stimulants are valuable auxiliaries. Transfusion, in cases of sudden collapse, without previous exhaustion of the

vital fluids, is employed with questionable propriety. The capillaries and larger vessels are replete with blood of deteriorated quality, and a further distention of them with a fluid, the temperature of which gradually diminishes to that of the body, is not calculated to relieve them. Vomiting and purging frequently succeed the experiment, even after considerable amelioration of the symptoms. These untoward and unexpected results are often to be ascribed to the undue distention of the circulatory system. The powers of life cannot adapt themselves at once to conditions so widely different from those of health. It is admitted that saline injections frequently cause a sense of distention and much uneasiness to the patient, and continue until the system is relieved, by purging or vomiting, of its super-abundant fluid. In some cases, the breathing is accelerated and oppressed, and these symptoms are frequently the immediate precursors of dissolution. In the dissection of these cases, considerable congestion of the lungs is mostly observed. May not these symptoms be attributed to the difficulties opposed to the circulation of the injected matters; and if so, is it not evident that the injection of a large quantity is, in this, and all similar instances, calculated to

be decidedly injurious? The almost stagnant blood ought rather to be solicited than forced into circulation by the means employed; and to effect this, a few pounds only of fluid should be injected at once, and its operation should be rendered efficient by the prompt and active employment of various auxiliaries. To these a reference has been made. An examination of the numerous accounts which have been published respecting venous injection, is not fraught with unalloyed gratification. Some authorities state that the experiment was altogether a failure. Others succeeded only in three or four instances in twenty. May not a great proportion of the fatal results be traced to an imperfect knowledge of the morbid conditions demanding, and, if understood, regulating such treatment, as well as suggesting the application of other measures? Saline injection is, indeed, the only means which can hold out the slightest chance of benefit in numerous cases of collapse. When the circulatory system is exhausted of the serum, the remedies previously considered will be of little if any efficacy. The adoption of them presupposes the existence of something to work upon or influence, and without this they are perfectly inert. *Transfusion bestows an equivalent for*

that which is lost, and prepares the vital powers for the operation of other measures.*

* The following account of 105 cases in which venous injection was employed, has been drawn up in a tabular form, by Dr. T. G. Wright, a talented Physician, of Wakefield :—

"In order to form an impartial judgment on the value of injections into the veins, as remedial agents in Cholera, the Editor was at one time in the habit of entering, in a tabular form, every case that was reported in the journals, in which this mode had been employed. He collected 105 cases, of which the following statement is a summary :—

No.	Hours ill.	Injected.	Recovered.	Convalescent.	Under Treatment.	Died.
15	4 to 12	℥24 to 305	1	2	—	12
13	12 to 27	℥23 to 292	3	4	—	6
77	unknown.	℥14 to 640	1	1	15	60
105		14 to 640	5	7	15	78

See "*An Inquiry into the Nature and Properties of the Blood in Health and Disease, by the late Charles Turner Thackrah, arranged and revised by T. G. Wright, M.D.*"

CHAP. VII.

A BRIEF SUMMARY OF THE CIRCUMSTANCES WHICH HAVE LED TO SUCH WIDELY DIFFERENT OPINIONS CONCERNING THE NATURE AND TREATMENT OF CHOLERA.

THE first step of the philosophical inquirer in every department of science is the accumulation of facts. The classification of them, according to certain analogies, leads to induction. These two processes demand and exercise very different powers of mind, and are seldom possessed in an eminent degree by the same individual. We may often see the plodding observer, whose capacity to trace the relations of things, or to discover the general principles to which they are referrible is extremely limited, anxious only to collect facts, and flattering himself that by this method he is making useful additions to the stock of knowledge. There can be no dispute about the value of facts, but there may be so much

misapprehension in observing, and inaccuracy in stating them, that they would mislead, were they implicitly relied upon in the investigation of principles. It has been said, and truly so, there are more false facts than false theories in the world. Every science affords ample illustration of this truth, but none to such a lamentable extent as that of medicine. How copious is its catalogue of facts, which are merely opinions on the vital powers—the nature and causes of their disturbance, and the remedial agents employed in their correction, and yet these opinions are regarded, by their respective authors, *as the faithful expression of clearly ascertained truths.* Whence originate the widely different views on these subjects? Much more in the careless and superficial examination of them, than in the extraordinary and varied modifications of the animal system. The judgment, biassed by particular notions, observes only a part of the complicated phenomena of life, and hence the interrogations of nature must necessarily be loosely and unsatisfactorily answered. The slow progress of some sciences arises from the difficulty of arriving at constant and well-established facts, *but that of medicine is to be traced to an imperfect analysis of the numerous facts*

constantly soliciting attention. Were these studied with the caution characterizing inquiries into the exact sciences, their relations and tendencies might be discovered, and the mind would then gradually ascend to general and comprehensive views. Observing these imperfections in the study of medicine, my object, in the foregoing pages, has been to institute a rigid examination into the nature and origin of the symptoms of one particular disease—the causes of its modifications, and the circumstances suggesting and accounting for successful treatment. This procedure will not be generally acceptable to the medical profession. It will be regarded as much too tedious and elaborate, and some, whose ideas of what is practical, consist in knowing what remedy or plan of treatment is recommended in any given disease, will consider the present undertaking exceedingly defective. To investigate and theorize on the conditions of the animal system—to dilate at length on the action of remedial agents—and to explain the various circumstances, not only suggesting, but imperatively requiring a peculiar mode of treatment, is certainly a procedure demanding the most patient and persevering attention of the mind—and causing much deliberation pre-

vious to the application of remedies. *Every step of such inquiry is, however, of a practical tendency;* for the results at which it arrives are alone those by which the employment of means can be safely directed, nor is the knowledge thus obtained partial, but has, indeed, a reference to the healthy and disordered conditions of the whole animal system. The necessity for such knowledge is not felt by the profession generally, as is proved by the eagerness with which a new or greatly vaunted remedy is adopted, and the confidence which it inspires. This confidence is not exactly proportionate to the respectability of the authority which prescribes, but to the limited acquirements which allow the mind to be thus influenced. And how often does it happen that the remedy or plan of treatment recommended is mere empiricism. To expose the opposite and ever varying modes of practice pursued, would present a melancholy picture of the state of medical science. The great variety in the remedial measures employed, would almost cast distrust upon the fact that the animal system is subject to uniform and general principles. But the true reason of the variety is the imperfect manner in which these principles have been

studied. The object of the preceding inquiries has not been to point out the efficacy of any remedy or mode of treatment, *except in connexion with certain clearly ascertained conditions of the body.* It is, therefore, evident that this can be determined only by an investigation of these conditions in each individual case. A similarity in the leading symptoms of the malady will not sanction a uniformity of practice.

The character of any prevailing disease is always greatly modified by the age, peculiar constitution and habits of the individual affected, as well as by many other causes arising from certain positions in society. To discover the degree of influence thus exercised is an important, but most difficult undertaking. Could this influence be ascertained, a specific or mode of practice applicable to all cases of any given disease might readily be discovered. The little attention which this subject has received, accounts for the readiness with which every new or untried remedy was adopted during the prevailing epidemic, and also, for differences of opinion at present existing. The principles of treatment are indeed almost as unsettled at this moment as they were when the disease

first appeared in this country. The field has been vast for investigation, but the truths evolved by it are dubious and undefined in character, nor can greater certainty be attained, except by an elaborate study of the vital powers. A knowledge of these will expose the absurdity of supposing any mode of practice applicable to the same disease, modified by different circumstances. The experience of others will not aid us materially in determining the efficacy of different measures. It is too often an unsteady light, which makes evident rather than dissipates existing darkness. Were the results of experience accompanied with a faithful detail of the circumstances which suggested and influenced the treatment, they would be of inestimable value. Without such detail they are often worse than useless. By misleading the judgment, they throw obscurities and stumbling blocks in the path of rational inquiry. It is difficult to divest ourselves of a partiality for our own views, or those of others, however unsubstantial they may be; and the general or indiscriminate application to which they lead, does not in medical practice immediately expose their fallacy. The extensive range on which they are brought to operate, necessarily includes many cases that

would recover under almost any treatment, and hence evidence of apparent success may be adduced in support of the crudest speculations. The most judicious treatment may fall into disrepute, by persons being ignorant of or not attending to the conditions to which it is alone applicable. Venesection, both local and general—internal stimulants—emetics—external heat—mercury—transfusion, and, a remedy often exceedingly efficacious—*that is doing nothing*—have appropriate morbid conditions which they are calculated to relieve.

Our object, therefore, should be to ascertain these conditions. Many of them are easy to detect. If an individual previously in good health, is suddenly attacked with the urgent symptoms of the disease, especially with severe cramps and prostration of the vital energies, in this stage of the complaint, the copious abstraction of blood from the arm will, perhaps, at once re-establish the disturbed balance of circulation. If the constitution, however, be exceedingly delicate, or debilitated by intemperate habits or pre-existing diarrhœa, such practice will be inadmissible or attended with questionable success, the fluids of the body being too diminished in quantity to continue

the energies of life. Cases continually occurred presenting every gradation of symptoms, and in constitutions possessed of such different degrees of tone and vigour, that no line of practice could possibly be applicable to the whole. This admixture of cases in the reports with which we were furnished, and rendered to others, *in connexion with the remedies employed,* has tended more than any other circumstance to involve the principles of treatment in doubt and perplexity. The number of cures, associated with the application of any remedy, could be no guide, scarcely, indeed to the intelligent observer of the practice, *because they might be only co-existent with it and not consequent upon it.* The truth of these remarks was amply corroborated by the repeated trials of remedies, stated as possessing almost the virtues of specifics. These invariably disappointed our expectations. The success adduced by others was not observed in our own practice. The disappointment cannot be attributed to the want of candour or honesty in those strongly recommending the remedial measures. The cause will be found in a difference of the cases treated—*a difference arising from peculiar local circumstances—conditions of the animal system or stages of the disease in*

duce its appalling effects, previous debility or derangement of the vital powers was mostly required. In the East, such a preparatory step was not so generally necessary, and hence the exciting cause must have been greater. If the distinctions between the two were less striking than is here represented, any approximation to them will explain the propriety of a different plan of treatment. When the circulating fluids are suddenly determined to the internal viscera, the animal system being previously healthy, the copious abstraction of blood is the most powerful and efficacious remedial agent we possess. It relieves directly the oppressed organs, and re-establishes the disturbed balance of circulation. What other means would be equally beneficial? Internal stimulants might, in many cases, meliorate the urgent symptoms, but inflammations and fevers would be liable to succeed their liberal exhibition. Most of the milder measures used by us would be altogether inefficient. Hence the practice of others, however successful, can be no guide, *unless the morbid states accounting for its salutary influence be clearly stated.* There is little doubt the disease was greatly modified in every country in which it appeared, from moral and physical differences in the condition

of the inhabitants, the season of the year in which it broke out, and the peculiarities of each climate. The prominent symptoms of the epidemic were not, materially altered. There were, however, modifications in its character not only in countries remotely situated from each other, but even in neighbouring districts. The general points of resemblance were the suddenness with which the vital powers were depressed—the occurrence of vomiting and purging, and the peculiarity of the rejected fluids—the dark or blue aspect of the body in the stage of collapse—the tendency to spasm, especially of the lower extremities, and the emptiness of the urinary bladder.—These were striking and prevailing symptoms. The diversities remarked were important. In some situations the atack was not preceded by premonitory diarrhœa. In others, this was almost universally observed. The spasms were described by some, as extremely violent, siezing the muscles of the back and abdomen and causing the most excruciating sufferings. According to others, the extremities only were generally affected, and these not always severely. The accumulation of blood, in some classes of cases, was exceedingly great. In others, this excessive congestion was more partial. The vital

energies were at times at once depressed, without having been preceded by any discharge of serum from the stomach or bowels, or accompanied with much spasm or pain. In this country, and perhaps throughout the continent of Europe, the blood after death remained fluid, rarely indeed shewing any tendency to coagulate. In the East, this was by no means so generally the case. Other differences of minor importance might be pointed out, such as the greater or less frequency with which certain organs were peculiarly affected, and the character of the diseases succeeding the melioration of the symptoms of collapse. It is not necessary to dwell on the consideration of these, as they chiefly arise from the above general differences. Sufficient has been stated to prove, that the principles of treatment must vary greatly in different situations. *Nor can any be laid down, except in connexion with clearly ascertained conditions of the vital powers.* Had not our own experience satisfied us, that recovery in many cases of Cholera was not attributable to the treatment employed, but to the efforts of nature, the various remedies prescribed and recommended, would have led to this inference. Many of these were mild and certainly incapable of producing important

changes in the animal system. They were all, however, more or less conjoined with general measures of great efficacy, such as friction, stimulating applications, or the employment of external heat. These, though of great value, were often altogether lost sight of in the estimate formed of a remedy, with the operation of which they were associated. When many important instruments are thus brought into action, it is not only difficult, but impossible to award to each its due share of credit. This, however, is not the only evil with which such procedure is fraught. There is seldom any attempt made to discriminate their relative merits. And it frequently happens, that the remedy, inefficient or perhaps injurious, receives the sole consideration and credit. The success co-existent with its employment is at once referred to it. How many of the vaunted specifics of the disease were indebted for their transitory reputation to circumstances with which they were accidentally or intentionally associated. The good *resulting from doing nothing* is never properly estimated in medical practice. Nature, in spite of our blunders and intermeddling, will often remove her own evils, and generously allows us to reap the credit.

The pathology and treatment of Cholera were not satisfactorily elucidated by dissections. The traces of diseased action were adduced in support of very different opinions. Nor is this at all surprising when the extent of the existing mischief is considered. The advocates of inflammation were rendered too confident by the abundance of proof apparently in favour of their doctrine. To whatever part of the animal system they directed their investigation, morbid conditions or structural changes—results of an inflammatory process were observed. These, however, were effects attributable to causes by no means difficult to determine, and amply sufficient to account for them. The disorder in the distribution and properties of the blood—*steps antecedent to any obvious inflammatory action, will explain the phenomena.* Had they been causes in place of effects, cases of recovery would have been few, and would have exhibited in every stage towards convalescence serious inflammatory symptoms. Even as effects they rendered recovery occasionally exceedingly tedious. The pathology of many diseases is known only by means of dissection, but this alone throws a dubious light on the nature of the late prevailing epidemic. The

inquiry to determine this matter, *must commence with the study of the vital powers in health—must trace their connexion and reciprocal action—so as to perceive how the derangement of one or more implicates the rest.* This mode of investigation terminates in the morbid effects produced, or appearances observed, on dissection. These, in addition to the data previously obtained, enables the mind to take a clear and comprehensive view of the subject. It is, indeed, the natural and only correct method of procedure. It can scarcely be said that the preceding inquiries have exhibited a strong bias in favour of any particular hypothesis. They have sought, though perhaps not always successfully, after facts, and have allowed these to suggest their own explanation. Were the epidemic to re-appear in this country, great anxiety would again be manifested for the discovery of remedies of peculiar efficacy and of general application. The catalogue of the *materia medica* was not quite exhausted during the late visitation. Many new changes may yet be rung upon it. Experience alone, as already stated, will never furnish such remedies, nor will they be suggested by a more accurate knowledge of the morbid effects exhibited by dissection. The

practical measures will necessarily be various; and the cases to which they are applicable, can be determined only by a clear conception of many circumstances, which do not admit of any concise definition, and if laid down in general rules, will require much judgment to put them in force. The nature and importance of these circumstances have been explained at length. Had any particular remedy been proposed in these pages for the cure of Cholera, it would have been presumptuous to have said, "this is the great desideratum, and it is unnecessary to extend our researches in quest of any other;" and yet the spirit of this language has often been expressed. Such arrogance indicates a narrow, contracted mind, unable to take in large and comprehensive views of any subject. My firm impression, however, is, that it is vain and unphilosophical to expect the discovery of any remedy possessing extraordinary virtues. The ordinary means with which we are provided are amply sufficient, if skilfully directed, to effect all that is possible in the treatment of the disease. From the tenor of the preceding investigations, it cannot be difficult to select that line of practice best calculated to effect the objects in view. The age—constitution

and habits of the patient are the first consideration---the stage of the disease---its duration and the character of the symptoms are the next. These cannot fail to suggest efficient and appropriate remedies. The intent of the practice, *in every stage of the affection, is to equalize the distribution and improve the qualities of the blood.**

* At the meeting of the British Association, recently held at Liverpool, Dr. Mackintosh, of Edinburgh, exhibited to the medical section many exceedingly beautiful morbid preparations illustrative of the condition of the animal system in cholera. Every organ was shewn to be more or less diseased. Dissections had long ago established this fact, and my own views in this inquiry are founded upon it. In presuming to differ from him, it is with diffidence, and with that courtesy which he always extends to others. In his remarks, however, on the morbid anatomical appearances, opinions were expressed which appeared at variance with his own indisputable facts. He stated that every capillary vessel was distended with blood, *therefore, there was no lost balance of circulation.* The inference was so unexpected from the premises, that at the conclusion of his remarks, I did not venture to allude to it, satisfied that I had misunderstood him. From an abstract of his communication, in a highly respectable medical journal, from which the following passage is taken, it appears there was no misconception on my part :— "He began his investigations," it is stated, "without any knowledge of the disease, further than there was a lost balance of circulation, and that fever followed. He had not been investigating the subject a fortnight before he found that he was incorrect. The very remedies in use for recovering the lost balance of circulation were positively painful to the patient. The cry was for exposure and cold drinks. One grand circumstance was, that the body was of a dark

The remedies to accomplish these ends are of course various. Copious bleeding from the arm, if the vital energies will admit of it, is the most powerful stimulant that can be employed. The application of heat, especially to the pit of the stomach, as well as its con-

colour. The question arose, on what that depended. He found the cause of it, was that every capillary vessel was distended with blood, therefore, there was no lost balance of circulation."* *The whole of my investigations go to prove, that the prevailing epidemic was a disease most strikingly characterized by disturbed balance of circulation,* and, moreover, that the remedies employed, were efficient in proportion as they tended to correct this morbid condition, The term, balance of circulation, may be defined, such a distribution of the blood, between the two systems, arterial and venous, *as is essential to the healthy action of the powers of life.* The degree of disturbance is of course exceedingly variable in different diseases. Determination of blood to an important organ, will necessarily interfere with the balance of circulation, and give rise to effects proportionate to its severity and other existing circumstances. Cholera is an exquisite illustration of the broken balance of circulation, according to the above definition, and this is corroborated by the statement of Dr. Mackintosh. "The accumulation of blood," he says "was not in one organ or in any set of organs, but in the vessels of all the organs. The abdominal aorta, in one case, was one inch in diameter, or three inches in circumference. The vena cava was one inch three-fifths in diameter. It was enormously distended with blood." The peculiar view which this talented physician takes of the subject, may perhaps be traced to the circumstance, *that all the internal organs are regarded by him, and justly, as similarly affected.* This will at once be admitted. The blood with which they are oppressed is, however, derived from some

* British Annals of Medicine, No. 12, vol. ii. p. 383.

tinued employment generally until a decided improvement takes place, requires no comment to enforce it. Under the head of heat are included, mustard poultices and stimulating embrocations, with unceasing friction. Immersion in warm water is, in many in-

part of the animal system. There are two sources only which can supply it—*the extremities and surface of the body.* The dark colour of the latter is no evidence that it possesses its usual share of fluid, it proves, indeed, that this is deteriorated in quality, *and a change in its chemical composition invariably happens in every instance of disturbed balance of circulation.* The Doctor remarks, "that the very remedies in use for recovering the lost balance of circulation were positively painful to the patient." By these means is understood the application of heat, and it is unquestionably true. This, however, may be shewn to arise from the fact which he denies —*the disturbed balance of circulation.* The cause of the pain has been accounted for in the foregoing pages, and was not, to the best of my knowledge, previously understood. The susceptibility to it, is always, *ceteris paribus,* in a direct ratio to the internal accumulation of blood. The greater this is, and the more feeble or interrupted is the circulation on the surface of the body. The ease with which the application of heat is borne, *may be defined to be according to the vigour of the superficially seated circulation.* When it is active, the heat is absorbed by the vital fluid, and diffused quickly throughout the system, but when there is little blood, and this comparatively at rest, distributed to the surface of the body, as in the collapsed stage of cholera, the heat is not absorbed, *and, consequently, it is painfully concentrated to the point to which it is applied.* There are no exceptions to this general law. Other facts might be adduced, as well as further reasoning, to prove the correctness of these views, in opposition to those which are here combated. This, however, is not necessary.

stances, much to be preferred to the vapour bath, which, from the languid circulation on the surface of the body, frequently causes too much pain. When the urgent symptoms are removed, small doses of calomel, with Dover's powder, or opium, and any simple cordial drink, may be given with very great advantage. At this time no remedy possesses the virtues of Mercury, and it should be used until the secretions of the bowels become healthy. In the earlier stages of the disease, and in constitutions not exhausted by serous evacuations or debilitated habits, emetics of mustard, salt, or ipecacuanha are, perhaps, not inferior in efficacy to venesection. In constitutions broken down, and in which the circulating fluids are greatly diminished in quantity, and what remains, inordinately accumulated internally, the benefit to be derived from emetics is extremely questionable. Indeed, emetics and bleeding are decidedly efficient only in cases *in which the circulating fluids are not greatly reduced in quantity, or inordinately accumulated internally.* In the first condition, the abstraction of blood, were it possible, would not arouse the diminished mass to invigorated motion; and the distressing action of emetics would tend to exhaust the already enfeebled

powers of life. In the second condition, the stream of blood which is made to flow from the vein is frequently too small to affect the internal congestion, and the same objection may be urged with much force against the efforts of vomiting. Both means may be employed with benefit as soon as the circulation is slightly invigorated. The cases difficult to treat, are those in which the blood is exceedingly diminished in quantity by antecedent diarrhœa, cases, perhaps, not seen until the stage of collapse is fully marked. The majority of these, whatever be the treatment adopted, prove fatal; and this will probably not be obviated, to any great extent, by the progress of medical science. The failure of success is not to be attributed to ignorance of the nature of the morbid conditions existing, but to the inability of art to resuscitate the weak and flagging powers of life. In such cases there are two effects to be counteracted, *the deficiency of blood, and its disturbed circulation.* The former cannot be accomplished by any of the various remedies previously considered, except transfusion. To invigorate the motion of the almost stagnant blood is no ordinary difficulty; but there are means by which it may be judiciously attempted. All

external measures calculated to excite the action of the superficially seated capillaries, are imperatively demanded, and cannot be too perseveringly enforced. Galvinism will be found a most valuable remedy. It will more immediately rouse the circulation than any other; and, as previously remarked, its application ought to be persevered in until the vital energies are steadily and generally re-established. In some of these cases, vomiting and purging cease several hours before death; in others they continue to the last. Internal stimulants may, perhaps, seem indicated from the exhaustion of the powers of life, but they are seldom of the slightest benefit. They often aggravate the urgent symptoms. Their employment is useless and distressing, from the cause which renders the application of heat to the surface of the body painful and inefficient. It is not intended in these concluding observations, to lay down at length the principles of treatment. These can only be arrived at by thoroughly understanding the morbid conditions existing. To elucidate these, in all their relations to numerous modifying circumstances, has been the object of this inquiry. It is for others to determine how far the task has been succesfully executed.

CHAP. VIII.

AN ENUMERATION OF A FEW OF THE REMEDIES WHICH HAVE BEEN EMPLOYED IN THE TREATMENT OF CHOLERA, AND REGARDED AS POSSESSING ALMOST THE VIRTUES OF SPECIFICS.

I. *The beneficial effects of Cold Water.* "Half a pint of cold pump water to be given as a glyster, and to be repeated every half hour, and at the same interval of half an hour, to take an effervescing draught. To have cold water in the dose of a full wine glass as often as the patient wishes." *Effects of the treatment*: "Since I have adopted this practice, my success has been almost incredible."

II. *Phosphorus.* "One grain of phosphorus to be given in the form of a pill, every one or two hours, according to the urgency of the case, until four or six have been taken." Stated to have been given "with extraordinary success."

III. *Mercury.* One authority says, "the cases are all treated precisely on the same *plan* and by one remedy. *The result was eminently successful.*" Another states, "that if ever the disease is actually cured, it is by means of this agent." The doses in which mercury has been employed, have varied exceedingly. One practitioner gives one grain combined with one drop of laudanum, every five minutes, another gives ten grains alone, every quarter of an hour, finding the "effects of opiates most pernicious."

IV. *Carbonate of Ammonia with effervescing saline draughts.* "The plan was very successful in the collapsed stage of the disease."

V. *Alkaline Remedies.* "I give the result of about one hundred cases successfully treated by alkaline remedies."

VI. *Opium.* One authority says, "opium is the sheet anchor in the treatment of cholera." Another, who exhibited large quantities of fluid opium, "that he *had been very successful,* as well in the West Indies as in England."

VII. *Sulphate of Copper.* "Superior effi-

cacy of the sulphate of copper above all the most lauded remedies hitherto resorted to."

VIII. *Croton Oil and Calomel.* "I was led to the use of frequently repeated small doses of irritating purgatives, as the most likely means of restraining the discharges. With this intention, I have given a combination, in the form of a pill, of croton oil with calomel and the extract of hyoscyamus, one-eighth of a drop of the former, and a grain and a half of each of the latter: *and have invariably found it to restrain the evacuations.*"

IX. *Bleeding to Syncope.* In the first and second stage of the disease this practice is said to have "generally stayed the vomiting and cramps."

X. *Emetic Tartar.* "I have always, and that in about fifty cases, cured this disease, truly marked by rice-water or urine-like looking stools, where coldness from exhaustion had not taken place, by giving thirty grains of tartarized antimony, in doses of five grains, every twelve minutes."

XI. *Muriate of Iron.* Stated to have

been exceedingly useful in many cases of Cholera.

XII. *Hydrocyanic Acid.* "This almost invariably stops the vomiting after two or three doses have been given."

XIII. *Oxymuriate of Potash.* "I have always checked the vomiting in Cholera Spasmodica by the administration of the powders of the Oxymuriate of Potash. I have seldom found it necessary to give more than two." Another authority states, "its effect is in general instantaneous."

XIV. *Lime Water and Milk.* "Two tablespoonfuls of lime water and one of milk, cold, every ten minutes, to an adult. The effects of this mixture on the stomach were truly surprising; and often not the less so, perhaps, when mercurials were rejected."

XV. *Croton Oil.* "I have given it in a number of cases; and of all, (some of them the most malignant) have lost but one, an old man of 68."

XVI. *Emetics of common Salt.* "This

plan of treatment has been extremely successful." Another authority states, "Under this plan of treatment, not a single case of spasmodic Cholera under my care has proved fatal, except when ardent spirits or laudanum had been previously given."

XVII. *Colchicum.* "I found this remedy successful in eight consecutive cases last year, and in every case in which I have had an opportunity of administering it this autumn."

XVIII. *Musk.* Fifteen grains, rubbed into a draught, with a lump of sugar, and a wine-glass of cold water. "This first step if taken promptly, will scarcely ever fail to arrest the progress of the disease."

XIX. *Purgative Plan of Treatment.* "We have seen enough of its good effects to convince us of its superiority over every other plan of treatment."

XX. *Acetate of Lead and Opium.* "Were I to enumerate all the cases of violent Cholera that yielded to this treatment, I should be led into a tedious but not an uninstructive detail."

XXI. *Galvanism.* "I cannot say, that by its agency I always cured my patients, *yet I never failed to produce the most decided benefit.*"

XXII. *C'est l'alcool Camphré (esprit de Camphre) donné à petites doses souvent répétées.** Sous quelque forme que se presente le Cholera, ce medicament peut être employé avec certitude de succès dans la première heure, avec probabilité dans les heures suivantes ; il a même réussi, en Hongrie, dans la dernière extremité. The success of the Homœopathic treatment was not confined to this remedy only, but is stated to have been as marked in the exhibition of minute doses of ipecacuanha, veratrum, arsenicum, cuprum, phosphorus, and nux vomica. Indeed, one writer states, that the Founder of this extraordinary system, "*trouve le Cholera une des maladies les plus faciles à guerir dans son principe.*"

XXIII. *Effervescent Draught to arrest Vomiting.* "One scruple of the subcarbonate of potash is dissolved in an ounce of peppermint water, with one drachm of the tincture

* Les proportions dont je me suis servi sont, ʒj de Camphre dissous dans ʒvi d'esprit-de-vin, deux gouttes de cinq en cinq minutes, dans une cuillerée d'eau sucrée froide.

of catechu, one of simple syrup, and ten drops of the tincture of opium, for the *alkaline* draught. Eighteen grains of citric acid is then dissolved in an ounce of water for the acid draught. The alkaline is poured into one glass, the acid into another, when the patient is directed to take a glass in each hand, swallow the alkaline, and the *instant* the glass is from the mouth swallow the acid. Thus the extrication of carbonic acid takes place entirely *within the stomach.* This is a simple but effectual mode, which I have followed for nearly forty years in the treatment of Cholera Morbus, *and in no one case has it failed.*"

It would be easy to multiply authorities under the head of each of the foregoing remedies, but as this would not be any evidence of their specific virtues or general application, it is not deemed necessary. A knowledge of the manner in which these remedies operate can scarcely fail to shew that the success contemporaneous with their employment, must, in many instances, have been accidental, either from being conjoined with other measures, left entirely out of consideration, or from a peculiar condition of the animal system, admitting of recovery under very different modes of treatment.

NOTES.

NOTE A. Page 74.

In the section, on post-mortem appearances in cholera, the account of the morbid effects discovered on dissection, is exceedingly brief. It was not deemed necessary to enter fully into the detail of a subject with which most are well acquainted. The descriptions given by all writers accord in all important points.

NOTE B. Page 157.

In numerous experiments which I performed some years ago on rabbits, for the purpose of determining the relation between modifications in the distribution of the blood, and the production of animal heat, it was shewn by dissections, that congestion existed long after the animal had acquired the power of generating heat as in health. This power had been previously diminished by internal or external sedatives, which always cause more or less congestion of the thoracic and abdominal viscera. The continuance of congestion, after the vital energies are greatly invigorated, is a fact not unworthy attention.

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